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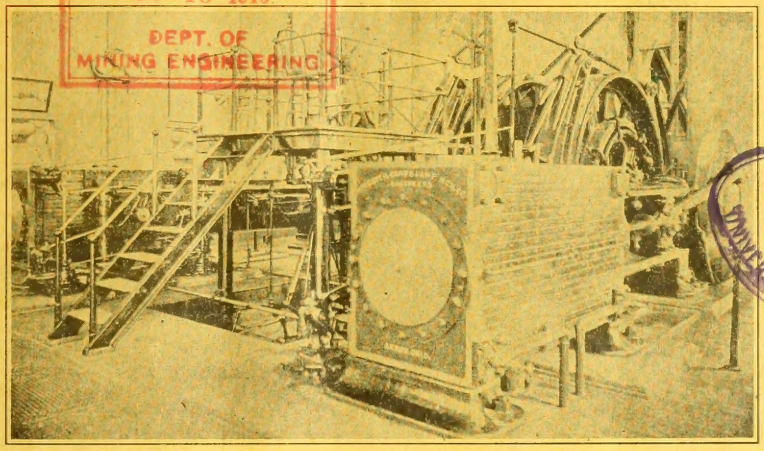
MINING AND ENGINEERING WORLD

With which is Incorporated The Mining World Index of Current Literature

No. 23. Vol. 44. JUNE 3, 1916. 10 cts. a Copy; $3 a Year.

JUN 18 1916
DEPT. OF MINING ENGINEERING

Does Anyone Want a Hoist as Large as This?



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WEBSTER, CAMP & LANE HOIST, First Motion, Double Corliss, Double Reel

SPECIFICATIONS:

Diameter of Cylinders	28″
Length of Stroke	72″
Number of Reels	2
Capacity of Reels	4,000′
Size of Flat Rope	5/8″x7″
Hoisting Speed, feet per minute	2,200′
Load Hoisted, lbs.	30,000
Approximate Shipping Weight, lbs.	400,000

CONDITION:

Having been in actual operation only a few months this Hoist is in the best of condition. It has been well handled and taken care of and shows no appreciable wear on any of its parts.

DELIVERY:

This machine can be loaded for shipment on a moment's notice, insuring an early delivery.

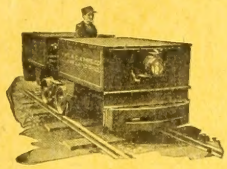
In the same plant with this Hoist is the following material:

2—22x24 Norwalk Compound Compressors, capacity 1160 cu. ft. each.
2—48″x12′ Air Receivers.
1—No. 9 B Cameron Sinking Pump.
2—Knowles Prospector's Sinking Pumps.
3—66x16 Horizontal Tubular Boilers.
4—60x16 Horizontal Tubular Boilers.
2—6x4x6 Duplex Pumps.
2—Mine Cages, etc., etc., etc.

THE MORSE BROS. MACHINERY & SUPPLY CO.
1732-50 WAZEE STREET **DENVER, COLORADO**

Buyers' Index, 102-115. Index to Advertisers, 127-128. Professional Directory, 116-121. Contents, 1051

We have been building ELECTRIC LOCOMOTIVES and MINE CARS for years.



No. 5760—Storage Battery Locomotive Center Operated. Three Ton and Larger Type.

This fact and a long list of satisfied customers should count when new equipment is planned.

Write for Bulletin.

THE ATLAS CAR & MFG. CO.

Dept. B. 1275 Marquette Road CLEVELAND, OHIO

5

On compressors, fans, hoists, engines, use

ALBANY GREASE

A quantity and cup will be sent for trial. Write.

ALBANY LUBRICATING CO.
708-10 WASHINGTON ST.,
NEW YORK

Write for Catalog M-4, prices and references.

CYANIDE PRECIPITATES, GOLD and SILVER

and for Melting Gold, Silver, Nickel, Cobalt, Brass, Copper, Aluminum, Etc.

We guarantee a saving of 60% using oil and gas instead of coal or coke, in the

Steele-Harvey Crucible Tilting Melting Furnace

now in use in the largest wide-awake plants of the United States, Canada and Mexico. Various sizes.

We manufacture the Rockwell Double and Single Chamber Cyanide Bullion Melting Furnaces for oil or gas.

We also build Tilting "Coal and Coke" Crucible Furnaces.

The Monarch Engineering & Manufacturing Co.

1200-6 American Bldg., Baltimore, Md., U. S. A.

K-G WELDING & CUTTING CO., Inc.

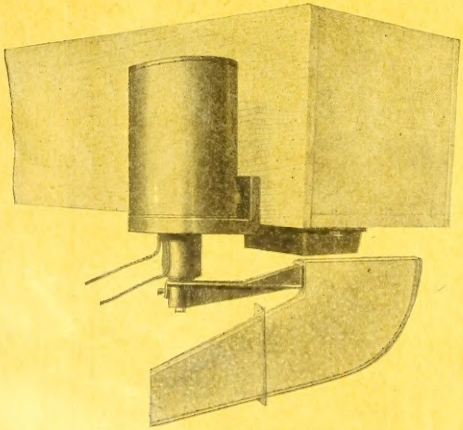
556 West 34th Street, New York City

OXY-ACETYLENE WELDING and CUTTING EQUIPMENT

This apparatus is particularly adapted to the mining and engineering field and no mine should be without one.

Write for Booklet

Flood Automatic Sampler



Sampler Attached to Bottom of Launder.

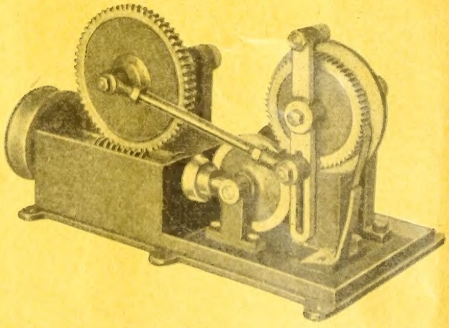
The Timing Device shown here is run by belt from the mill line shaft. It need not be near the Sampler. It can be placed outside of the building if necessary.

Will Find Where the Losses are in Your Mill.

Flood Samplers will automatically sample your ore or tailings at any predetermined intervals.

Works by electricity and controlled by a belt driven timing device.

They are simple and accurate. No trouble to install. No attention required to operate.



Hendrie & Bolthoff Mfg. & Supply Co.

Denver, Colorado

IS

Slope Haulage Your Problem?

Let Us Show You How It Has Been Worked Out for Some of the Largest Operators.

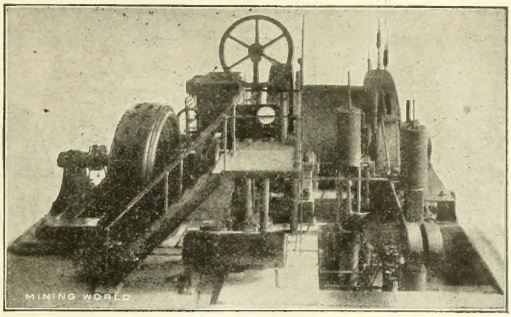
The unit illustrated was built for the Keystone Coal & Coke Co., Greensburg, Pa., and duplicated at Canadian Collieries, (Dunsmuir) Ltd., Vancouver Is., B. C.

It hauls 50 mine Cars, weighing 170 tons, on 6% maximum grade, at 1000 ft. per minute.

Rope pull, 28,000 lbs. Drum, 8x5 ft., all steel, grooved for 9000 ft. of 1¼-in. rope.

96-in. clutch and 124-in. gravity brake, both air operated. Single reduction Wuest gears.

700-hp. motor reversing controller and liquid rheostat



THE WELLMAN-SEAVER-MORGAN CO.

General Offices: CLEVELAND, OHIO

NEW YORK OFFICE: 50 Church St. DENVER OFFICE: 611 Ideal Bldg.

17

Steel Castings: Send your sketches for repair parts

White Iron: Our Specialty

(American Manganese Steel Co. Patents)

Komata Linings

Tube and Ball Mill

Semi-Steel

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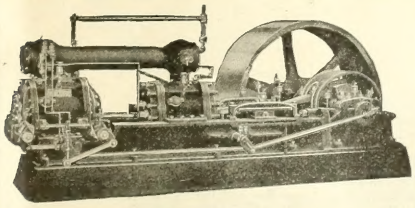
Wearing Qualities Unequaled

High Carbon Steel Castings

Queen City Foundry Co.

Denver, Colo., U. S. A.

Grates, Boiler Fronts, Flanged and Water Pipe Fittings, Pulleys, Gears



Modern Air Compressor

Variable Capacity

Constant Speed

Uniform Pressure

Starts with no load. Regulated by hand. Runs full load, part, or no load, according to the demand. Regulated automatically by air pressure. Unloads both stages of a compound compressor in same proportion, thus preserving at all degrees of load the proper division of work in the air cylinders. Not a superheating Squeeze-Off or By-Pass, but an entire dropping of load, running light, free and cool with no fuse-blowing or belt-breaking labor in resuming work. Picks up load progressively.

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AMERICAN ZINC ORE SEPARATING COMPANY
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Producers of Crushed Rock for Road Making and Railroad Ballast. Producers of Powdered Lime Stone for Fertilizer Purposes. Address, Holston National Bank Building, Knoxville, Tennessee.

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The measure of rock drilling efficiency secured depends primarily upon the rock drilling equipment used. Their design, materials and workmanship govern their performance.

Ingersoll-Rand rock drilling machines have been acclaimed superior in efficiency and durability to all others by thousands of users.

To acquaint you of this fact we have been publishing performance statements from all over the world conclusively proving that "Leyner-Ingersoll" Water Drills, "Jackhamers", "Stopehamers" and "Calyx" Core Drills will do all we claim for them.

Send for the Bulletins, they are stepping stones to greater profits in rock drilling.

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Offices the World Over.

For Canada, address Canadian Ingersoll-Rand Company, Montreal, Quebec.

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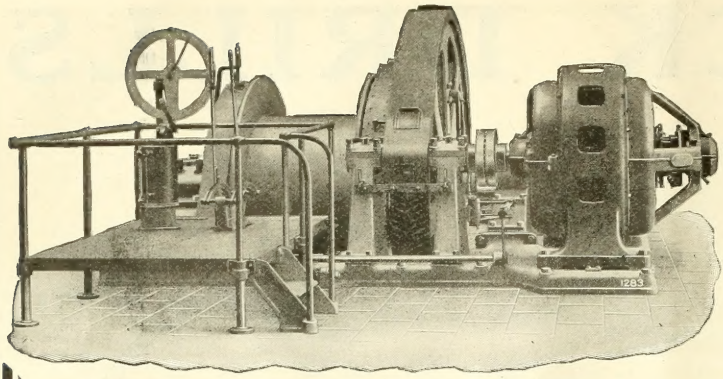


Band Friction Hoist. Steel Herringbone Gearing. Drum 60" dia., 40" face. Duty 25,000 lbs. at 600 f.p.m.

LIDGERWOOD MINE HOISTS

Built to Meet Every Mine Service

The first step in the design of a Lidgerwood hoist, is a careful study of the conditions and requirements of the mine. Our experience enables us to appreciate your needs and build a hoist best suited for your work.

We are prepared to furnish our electric hoists equipped with the most improved forms of automatic control and safety appliances, insuring easy operation and absolute safety.

ELECTRIC
built in any size

Write for Bulletins

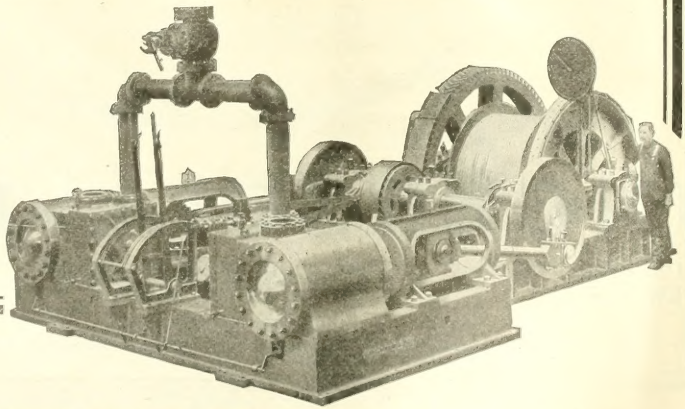
STEAM
built up to 1,000 h.p.

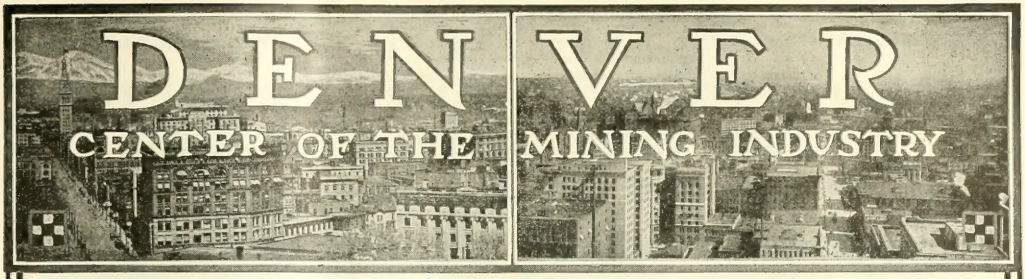
LIDGERWOOD MANUFACTURING CO.

96 Liberty Street, New York, N. Y.

Philadelphia Pittsburgh Chicago Seattle London, Eng.

Steam Haulage Hoist. Double 24"x 30" Cylinders. Herringbone Gearing. Drum 72" dia., 48" face. Duty 50,000 lbs. at 500 f.p.m.





For more than half a century DENVER has been the Leading Mining Machinery Center; and a very large number of the most important mines, mills and smelters of the continent have been equipped with complete outfits coming from DENVER.

The companies named below can furnish everything needed for the modern mining and metallurgical plant; such as compressors, drills, cars, skips, hoists, crushers, screens, elevators, conveyors, rolls, stamps, tube mills, ball mills and other fine grinders, concentrating tables, pneumatic jigs, classifiers, dewaterers, thickeners, agitators, vanners, pumps, sampling and laboratory plants, mechanical roasters, electrostatic separators, assay and chemical supplies, smelting and bullion furnaces of all types, converters, ladles, slag pots and all accessory apparatus, including power machinery, pulleys, gears, shafting etc., rails, screen bars, riveted steel pipe, electrical apparatus and supplies.

The largest and only complete stocks in the West are carried in DENVER.

With railroads radiating in all directions, delivery on orders can be made promptly.

Save Money and Time, insure the efficiency of your plant and Secure Repair Parts immediately, when needed, by ordering from DENVER.

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Denver Engineering Works, 30th & Blake Sts.,
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Hendrie & Bolthoff Mfg. & Supply Co., 1621-39 17th St.,
Mine & Smelter Supply Co., 17th & Blake Sts.,
Morse Bros. Machinery & Supply Co., 1721 Wazee St.,
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The Dorr Company, 1009 17th St.
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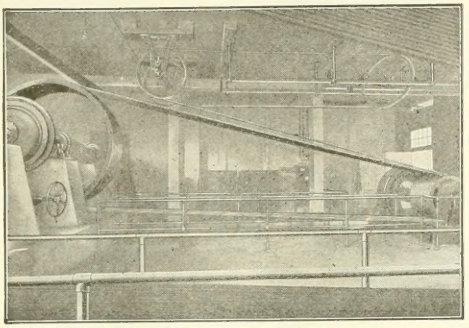
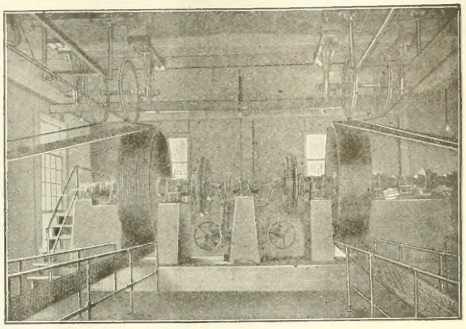
DODGE

Dodge Rope Drives for Fan Driving Purposes



Dodge Rope Drive as used by Pittsburgh Coal Co., for Fan Driving Purposes, at California, Pa.



Method of Mounting Dodge Rope Drive Equipment on Concrete Piers, at the Pittsburgh California Mine.

IN an effort to provide against interruption of service and secure the highest efficiency possible in operation, a number of mining companies have departed from ordinary practice, duplicating the driving machinery in the fan house and providing rope transmission between motors and fan.

¶ In the ventilating plant of the Pittsburgh Coal Company, Crescent Mine, California, Pa., we have installed the Dodge American System of Rope Driving with splendid results. The rope sheaves are proportioned to operate the fan at normal speed with a motor speed of 400 r.p.m., so that full motor speed would run the fan at 127 r.p.m., or 10 per cent above normal.

¶ The sheaves each carry 16 wraps of 1-inch Dodge "Firmus" Manila Transmission Rope, and are exact duplicates. The motor sheaves are 42-inch and the driven sheaves 107-inch diameter. The latter are mounted on hollow or quill shafts, through which a 7-inch Dodge jack-shaft passes. The jack-shaft is rigidly connected to the fan axle with a flanged coupling, and is engaged by Dodge split friction clutches (48 inches), bolted to flanges on the ends of the quill shafts, and operated by hand-wheel and pinion. The quill and jack-shafts are supported independently in Dodge adjustable bearings, resting on concrete pedestals, which are joined by a continuous concrete footing to prevent uneven settling.

¶ Either drive can be thrown in or out without changing the speed of the fan, in fact the sheaves and clutches on the quill shafts being split, one drive could be dismantled without interfering with the operation of the other. The ropes run exceedingly smooth and are practically noiseless. In addition, when worn out their replacement is a matter of small expense.

¶ We recommend our rope driving system for this class of service and would be pleased to consult with mine owners, managers on such installations. Our engineering experience dating back to 1881, is at your disposal free of obligation.

Dodge Sales and Engineering Company

Distributor of the Products of Dodge Manufacturing Company

Power Transmission Machinery for Mine and Mill

General Offices and Works : Mishawaka, Ind.

Link Belt & Dodge Products Co., Portland, Ore.
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Harron, Rickard & McCone, San Francisco and Los Angeles

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Hendrie & Bolthoff Mfg. & Supply Co., Denver
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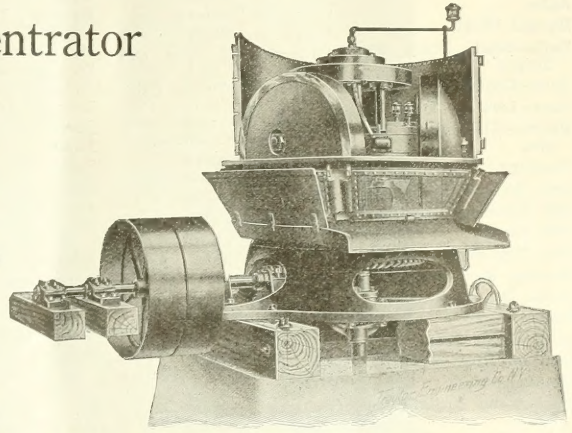
Advertised machinery is the most dependable.

An Ideal Machine For Preparing Tungsten Ore For Concentration

A Six Foot TRAYLOR CHILIAN MILL

Put Your Concentrator
In Operation
At Once.

We Can Ship This
Mill **NOW** Saving
You a $1,000.00.



IT HAS

A Cast Steel Spider.
Rigidly held Axles.
Dust Proof Bearings.
Self Adjusting Main Shaft or Spindles.

IT CAN

Be oiled while running at full capacity.
Be relieved at once, while in operation, should it became choked.
Be purchased for 80% of present selling price.

IT WILL

Deliver an ideal feed for concentrating tables or jigs.
Crush from ½" to 40 mesh at maximum capacity.
Produce maximum tonnage for minimum horse power.

THE WHY

This mill was made for one of our very good customers as part of a complete equipment for a supposed zinc mine.

Our Engineer was asked to make an examination of this mine and after doing so, he advised against the erection of the mill for which we had received the order for the entire equipment, including the Chilian mill we are now offering you.

We prefer to lose an order any time to having Traylor machinery used for monumental purposes by our friends and customers.

TRAYLOR ENGINEERING & MANUFACTURING CO.

Main Office & Works,
Allentown, Pa., U. S. A.

New York Office, 34 Church St. Western Office, Salt Lake City, Utah.

Tell the advertiser you saw it in the Mining and Engineering World.

DO You Want the Benefit of Competition in Purchasing Supplies for Your Mine, Mill or Smelter?

If so, let us quote on your requirements. We buy from mill or factory on the best possible terms and can have direct shipments made to you, in large or small lots, at prices below what you are probably paying. Our sales include:

Air Tanks and Cylinders
Alloys
Anti-friction Metals
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Bars—Concrete
Bars—Iron and Steel
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Belt Dressing
Belt Fasteners
Belt Hooks
Belt Tighteners
Bending Machines
Boiler Compound
Boiler Plates
Boiler Shop Tools
Bolt and Rivet Clippers
Bolts and Nuts
Boring and Drilling Machines
Brick—Chrome, Heat Insulating, and Magnesia
Buckets—Grab
Bushings—Phosphor Bronze
Castings—Iron, Steel, Brass Bronze and Aluminum
Cement—Portland, Belt, Iron and Rubber
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Chasers—Threading
Chemists' Supplies
Chucks for Machine Tools
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Clutches
Coils of Pipe, Iron, Copper and Brass
Concrete Machinery
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Controllers—Electric
Corundum Wheels
Cotter Pins
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Cranes—Hand Power, Locomotive and Portable
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Creosoted Timbers
Cross Ties—Steel
Cutters—Gear Pipe and Wire
Dies—Drop Forge, Gripping and Heading, Pipe Threading and Screw and Thread Cutting
Drilling Machines
Dust Collecting Systems
Economizers—Fuel
Emery Wheels
Engines—High-Speed
Exhaust Fans
Exhaust Heads
Expansion Bolts
Eye Bolt Machinery
Eye Protection Glasses
Fans—Ceiling
Feed Water Heaters and Purifiers
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Flexible Shafting
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Gas Producers
Gauges—Machinists, Pressure and Vacuum
Grate Bars
Greases
Grinding Machines and Wheels
Guards—Machinery
Hack Saw Machines and Blades
Hammers
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Hydrants
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Ladles
Lathes
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Lathing Metal
Leather—Cup, Hydraulic and Lace
Lockers
Lubricants
Mechanical Draft Apparatus
Metal Checks
Metals—Bearing, Brass and Bronze
Nails
Nuts
Oil Burners
Oil Filters
Oilstones
Oilers
Oxy-Acetylene Welding and Cutting Apparatus
Oxygen
Packing—Asbestos and Rubber, Iron and Wool Felt
Picks
Phosphor Bronze
Piling—Sheet Steel
Pipe
Pipe Covering, Asbestos and Magnesia
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Pipe Fittings
Plates—Iron and Steel
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Pulleys and Idlers
Punches and Dies
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Pyrometers
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Saws
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Water Softening and Purifying Apparatus
Water Towers
Wheels
Wrenches

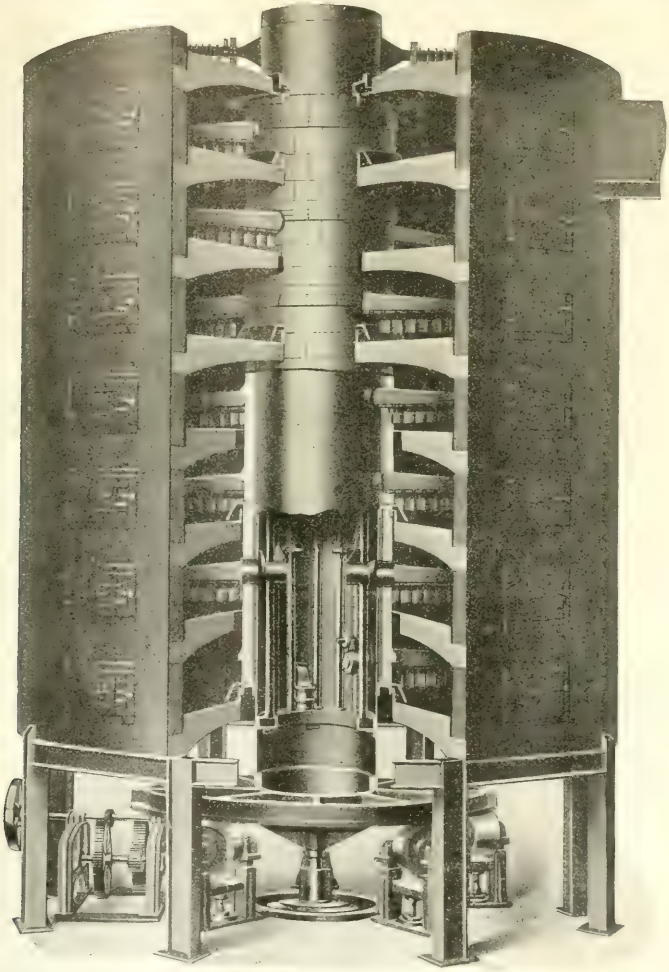
We can furnish supplies for the company store or commissary and can undertake orders for the purchase of anything needed in a mining community. ***Get in Touch with Us.***

M. B. Skinner & Co., *Distributors,* **558-562 W. Washington St., Chicago, Ill.**

Advertised machinery is the most dependable.

THE WEDGE MECHANICAL FURNACE

PATENTED



When You Want Tonnage—

Shut-downs for mechanical repairs are expensive. High-grade equipment is cheapest in the long run. Remember, all mechanical repairs incident to the operation of a roaster can be made in the Wedge Roaster WHILE IT IS HOT.

Write us fully, stating analysis of ore, concentrates, mixture or material you desire to roast, characteristics and physical condition of same, number of tons to be treated per 24 hours, and results desired in the calcine.

Wedge Mechanical Furnace Company

Greenwich Point, Philadelphia, Pa.

Tell the advertiser you saw it in the Mining and Engineering World.

TEST YOUR ORE for commercial recovery of your values before you install machinery.

Our laboratory is fully equipped with all modern processes, including *Huff Electrostatic Separator* and *Plumb Pneumatic Jig* and *Oil Flotation.*

Write—

American Zinc Ore Separating Co.

1218 Foster Building, Denver, Colo.

Tell the advertiser you saw it in the Mining and Engineering World.

MORSE Chain Drive
Means Positive Drive With Flexibility

THE ideal positive-flexible drive would combine the advantages of both gearing and belting without their disadvantages. Such a drive is the MORSE Silent Chain Drive.

It is more efficient than either belting or gearing when new and sustains its high efficiency (almost 99%) throughout its life.

It affords the positiveness of gearing, but without the noise, wear and shocks as more teeth on the sprockets are brought into working contact at one time.

MORSE Chain Drive affords the flexibility of belting but without the slip and lost power and without the constant necessity for adjustment and repair.

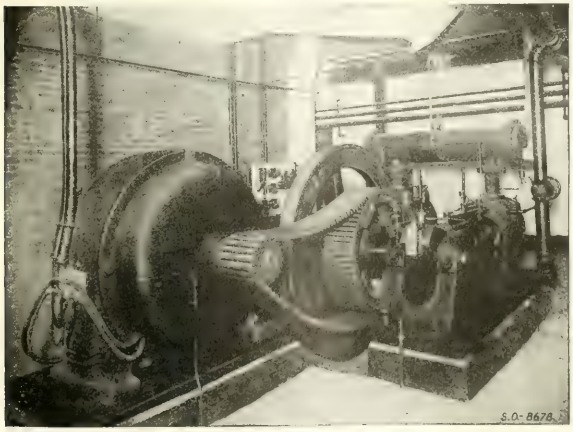
MORSE Chain Drive can be used on either very short or moderately long centers, in hot, cold or damp places, at high speed or low speed, and for any amount of power from ¼ H.P. to 5,000 H.P.

MORSE Chain Drives are now in use to the extent of over one and one-quarter million horsepower, and the exclusive "Rocker-Joint" is largely responsible for their satisfactory service and economy.

Our nearest office will gladly furnish full particulars. Send coupon below.

Morse Chain Co., General Office and Works, **Ithaca, N. Y.**

NEW YORK, 50 Church Street
BOSTON, 141 Milk Street
CHICAGO, Merchants L. & T. Building
PITTSBURGH, Westinghouse Building
CLEVELAND, 421 Engineers Building
DETROIT, 1003 Woodward Ave.
SAN FRANCISCO, Monadnock Building
ST. LOUIS, Morse Engineering Co., Chemical Building
KANSAS CITY, Morse Engineering Co., R. A. Long Bldg.
MINNEAPOLIS, Strong-Scott Mfg. Co., 413 Third Street, S.
ATLANTA, Earl F. Scott, M. E., 702 Candler Building
GREENSBORO, N. C., G. W. Pritchett, 805 Ashboro, St.
Licensees for Europe: The Westinghouse Brake Co., Ltd., 32 York Road, King's Cross, London, N.



100 H.P. MORSE Silent Chain Drive to Compressor.

Morse Chain Co.,

.....

Gentlemen:—Please send me your latest publication on "A CHAIN OF EVIDENCE" and information relating particularly to the application of MORSE Silent Chain Drive to.....

.....Machinery.

We are interested in a drive of about.....H.P. for driving..... .....

from.....

Name.....

Company.....

Address.....

S J, Mg. & Eng. World, 6-3-16

Advertised machinery is the most dependable.

WHAT THE DENVER "DREADNAUGHT" DRILLS ARE DOING

Walter Fitch, Jr., a mine development contractor of Eureka, Utah, who has been operating in the Tintic District, reported that in February, 1916, he drove 1411.10 ft. in 241 shifts with 11 "Dreadnaughts." He now has 20 "Dreadnaughts" and recently on four different contracts has been averaging better than 6-ft. pulled per machine, per shift, with these drills.

In the Dome Mines, South Porcupine, Ontario, 5 "Dreadnaughts" were used unmounted as hand drills for enlarging a "raise". The ground was a mixture of white quartz and schist, yet they averaged thirty-four 10-ft. holes a shift.

Foley Bros., Welch & Stewart, the contractors who are driving the Rogers Pass Tunnel, Glacier, B. C., found the "Dreadnaught" to be superior to all other types of drills they had tried. They report that their record on the enlargement work for January with the "Dreadnaught" Drills averaged 79.8 ft. drilled by each machine per shift.

S. G. Taylor, Superintendent of the Mid-West Tunnel, reports that with three "Dreadnaughts" they drove a 6½x8 ft. heading, 237 ft. in thirty shifts.

One of the "Dreadnaught" Drills used by Walter Fitch, Jr., of Eureka, Utah., for development work in the Tintic District.

WAUGH
"VALVELESS"
STOPERS

THE Denver Rock Drill Manufacturing Co.

DENVER, COLO.

225 Rialto Bldg., San Francisco, Calif.
301 San Francisco Street, El Paso, Texas
508 First Avenue South, Seattle, Wash.
34 Queen Street, Melbourne, Australia

Houghton, Mich. Joplin, Mo.
CANADIAN ROCK DRILL COMPANY, LTD.,
42 Scott St., Toronto, Ont., Selling Agents.

30 Church Street, New York City
115 W. 2nd South Street, Salt Lake City, Utah
56 E. Broadway, Butte, Mont.
Royal Chambers, Johannesburg, South Africa

L 13

Part of a shipment of 12 direct-flow Epping-Carpenter Power Pumps fitted with WUEST Gears.

Lines of Machines Equipped with **Wuest**

Cut Steel Herringbone Gears Are Now a Common Sight

You will find them in Hoisting, Compressor or Blower Plants, in Ore Reduction Mills, in Pumping Stations, etc., as well as in the Machine Shops and on the Assembing and Erecting Floors of the Leading Manufacturers of Mine, Mill and Smelter Equipment.

The Reason is Their Service.

The increased efficiency which the gears bring about in the operation of the machines is an important element of economy and one which receives increasing recognition from progressive managers.

Wuest Herringbone Gears are made in all sizes from 2 in. to 16 ft., and any width of face up to 72 ins.

With these gears reductions as high as 20 to 1 are readily effected. No intermediate gearing, shafts, or bearings are needed—nothing but the *Wuest* gear and pinion, which are quiet, free from vibration, hammering and back-lash. All such elements of rack and loss are done away with by the continuous tooth engagement.

Let us know your Gearing Problems. Our Engineers will help you to work them out along the lines suggested by the best designing and operating experience.

THE FALK COMPANY

Sole Owners for U. S. and Canada

Milwaukee, Wis.

AGENTS

M. P. Fillingham.....50 Church St., New York
W. O. Beyer.....Park Bldg., Pittsburgh
Vulcan Iron Works.....Wilkes-Barre, Pa.
Denver Engineering Works....Denver, Colo.
F. W. Grimwood, Santa Marina Bldg,, ... San Francisco, Calif.

National Defense and International Peace

What the Engineers are Doing

THIRTY thousand American engineers and chemists are making a card index survey of American industry so that it may be prepared for its vital part in defending the country, if need comes. The past eighteen months have taught us here in America what lack of industrial preparedness has meant to some of the countries now at war. These nations had the ships and they had the men; but when the hour struck, their factories were not able to furnish the colors with arms and shells and powder. Their factories were not prepared. And our factories are not prepared.

But it is not enough to draw a moral. In the United States five great Engineering Societies—Civil, Mining, Mechanical, Electrical and Chemical—have pledged their services to the Government of the United States, and are already working hand in hand with the Government to prepare industry for the national defense. They receive no pay and will accept no pay. All they seek is opportunity to serve their country, that she may have her industries mobilized for defense.

All elements of the nation's life—the manufacturers, the business men, and the workingmen—should support this patriotic and democratic work of the engineers, and assist them cheerfully when asked. *There can be no better national insurance against war.*

The Associated Advertising Clubs of the World, representing all advertising interests, have offered their free and hearty service to the President of the United States, in close co-operation with these five Engineering Societies, to the end that the country may know what the engineers are doing. The President has accepted the offer. The engineers have welcomed the co-operation.

This advertisement, published without cost to the United States, is the first in a nation-wide series to call the country to the duty of co-operating promptly and fully with the engineers.

NAVAL CONSULTING BOARD OF THE UNITED STATES
IN CO-OPERATION WITH

THE AMERICAN SOCIETY OF CIVIL ENGINEERS
THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS
THE AMERICAN INSTITUTE OF MINING ENGINEERS
THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS
THE AMERICAN CHEMICAL SOCIETY

ENGINEERING SOCIETIES BUILDING 29 WEST 39th STREET, NEW YORK

The Merrick Conveyor Weightometer

WEIGHS THE ORE WHILE IT TRAVELS

Part of Conveyor System, with one of 21 Merrick Weightometers at Inspiration Mill, Miami, Ariz.

Weighs Continuously and Accurately

Without Attendance

Records Results Continuously

As the ore travels along on the belt conveyor, the **Weightometer** weighs it. An ingenious integrating device takes into consideration the weight on the belt and the velocity. Whether the load is continuous or intermittent, uniform or variable, the recording counter gives a continuous record, as a gas meter records the flow of gas.

Your mill must be supplied at a certain rate per hour to operate most efficiently. Back on the raw material line the Weightometer **stands guard.** A glance at its indicator shows whether or not the right quantity of ore is passing to meet the demand. It tells you when to speed up or slow down the ore stream.

There is no separate weighing operation, as with a hopper scale. No weighman is required. Everything about it is automatic.

Send for complete description of this weighing device which does away with guessing at tonnage.

Merrick Scale Manufacturing Company, Passaic, N. J.

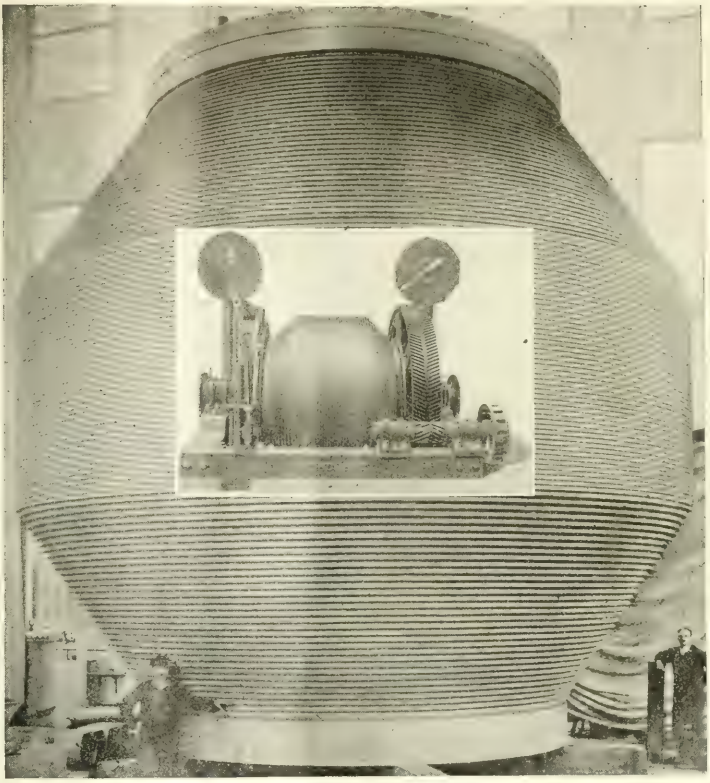
Richardson Scale Company, General Sales Agents

NEW YORK	CHICAGO	BOSTON	OMAHA	BUFFALO
DENVER	MINNEAPOLIS	MEMPHIS	SAN FRANCISCO	WITCHITA

CAST IRON PIPE
"Preparedness"
As early as 1746 the city of London began preparations against the necessity for periodic renewals (about every twenty years) of the wooden water mains then in use.
In that year the Chelsea Water Co. installed a line of 12-inch cast iron flanged pipe.
This pipe was lifted and relaid in 1791 (45 years later) "on account of the packing in the joints being perished."
About this date one of the Engineers of the Chelsea Co., Mr. Thomas Simpson, invented the present type of bell and spigot joint and Cast Iron Pipe rapidly replaced all the wooden mains for both water and gas distribution. Cast Iron Pipe is the only kind now used for this purpose in the great city of London.
The resistance of Cast Iron Pipe to the destructive influences of Rust is not a matter of theory—it has been firmly established by the actual service test of more than 250 years.
The following makers of Cast Iron Pipe and Fittings are independent of each other and competitors; inquiries may be sent to any or all of them with assurance of prompt and full response:
American Cast Iron Pipe Co. Birmingham, Ala.
James B. Clow & Sons Chicago, Ill.
Donaldson Iron Co. Emaus, Lehigh Co., Pa.
Glamorgan Pipe & Foundry Co. Lynchburg, Va.
Lynchburg Foundry Co. Lynchburg, Va.
Massillon Iron & Steel Co. Massillon, Ohio
Standard Cast Iron Pipe & Foundry Co., Bristol, Pa.
United States Cast Iron Pipe & Foundry Co., Philadelphia, Pa.
CAST IRON PIPE

Advertised machinery is the most dependable.

NORDBERG
MACHINERY



NORDBERG
MACHINERY

HOISTS

With Cylindro-Conical Drums

Where hoisting is to be done in balance, from a fixed level, the cylindro-conical drum decreases starting moment and the size of cylinders on a steam hoist, or the starting torque and current of an electric hoist.

We illustrate herewith the cylindro-conical drum of the largest steam hoist in the world and also a small cylindro-conical drum as applied to an electric hoist.

In Northern Michigan alone, we have in operation, 37 hoists with drums of the cylindro-conical type. Special designs to prevent distortion of drum and excessive sagging of the shaft have been developed for the large hoists and are applied where necessary, for small hoists.

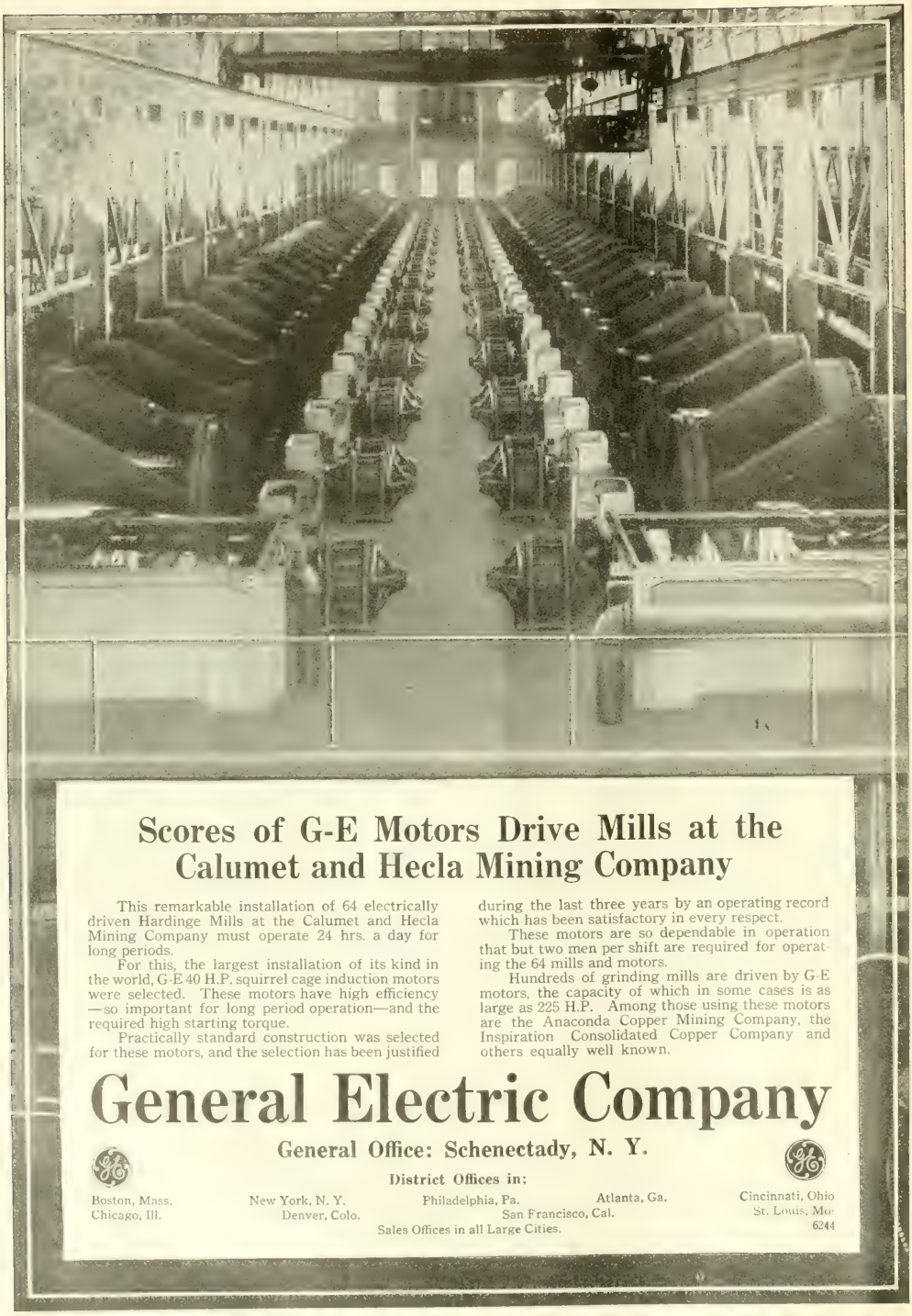
For further information send for Bulletin 23 on Steam and Air Hoists, and 24 on Electric Hoists.

Nordberg Manufacturing Company

1452 Chicago Ave., Milwaukee, Wis.

Manufacturers of High Efficiency Corliss Engines; Uniflow Engines; Poppet Valve Engines; Nordberg-Carels Diesel Engines; High Compression Oil Engines; Air Compression Oil Engines; Air Compressors; Blowing Engines; Hoisting Engines; Pumping Engines; and other machinery. 4

Tell the advertiser you saw it in the Mining and Engineering World.



Scores of G-E Motors Drive Mills at the Calumet and Hecla Mining Company

This remarkable installation of 64 electrically driven Hardinge Mills at the Calumet and Hecla Mining Company must operate 24 hrs. a day for long periods.

For this, the largest installation of its kind in the world, G-E 40 H.P. squirrel cage induction motors were selected. These motors have high efficiency—so important for long period operation—and the required high starting torque.

Practically standard construction was selected for these motors, and the selection has been justified during the last three years by an operating record which has been satisfactory in every respect.

These motors are so dependable in operation that but two men per shift are required for operating the 64 mills and motors.

Hundreds of grinding mills are driven by G-E motors, the capacity of which in some cases is as large as 225 H.P. Among those using these motors are the Anaconda Copper Mining Company, the Inspiration Consolidated Copper Company and others equally well known.

General Electric Company

General Office: Schenectady, N. Y.

District Offices in:

Boston, Mass. New York, N. Y. Philadelphia, Pa. Atlanta, Ga. Cincinnati, Ohio
Chicago, Ill. Denver, Colo. San Francisco, Cal. St. Louis, Mo.

Sales Offices in all Large Cities.

6244

Advertised machinery is the most dependable.

Chalmers Ball Mill

Saves Time Relining — *Saves Time Adjusting*

Saves Freight — *Can Be Used in Place of Stamps*

Saves Cost of Buildings — *Saves Horse Power*

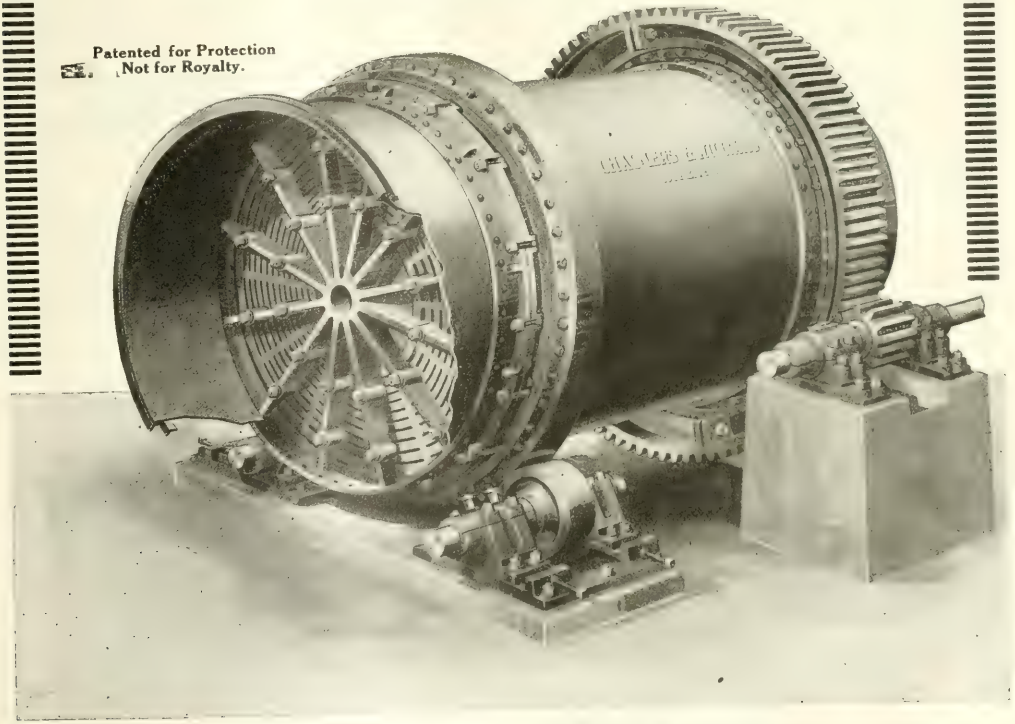
Saves Labor — *Saves Repair Cost*

Manufactured and sold only by

CHALMERS & WILLIAMS

Chicago Heights, Illinois

Patented for Protection
Not for Royalty.



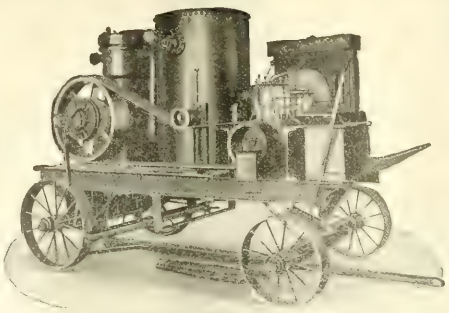
ZIN-HO

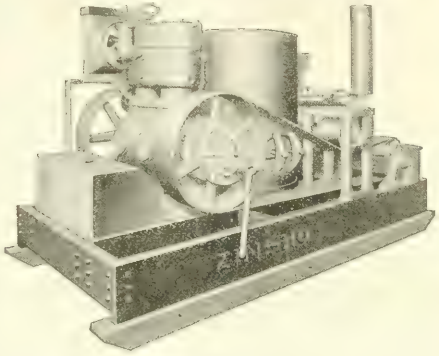
Portable and Semi-Portable Air Compressor

Built in Eight Sizes

Simple
Reliable
Light Weight
Rugged

Equipped with
Gasoline 4 Cylinder Engine, or
Kerosene 4 Cylinder Engine, or
Electric Motor





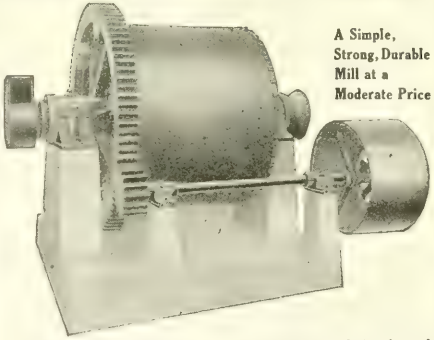
These plants are complete in every detail and are ready to operate immediately they arrive at destination. Some of them are operating continuously twenty-four hours a day with very little attention.

Just the plants to show economy, when small units replace large central plants, thereby eliminating long pipe distances, and insuring greater terminal pressure.

If you tell us just what your conditions are and about what you wish to accomplish, we will use our best efforts to offer something that will meet your requirements to your own satisfaction.

ZIN-HO Manufacturing Co.
1326 South Michigan Blvd.
Chicago, U. S. A.

Standard Ball Mills



A Simple, Strong, Durable Mill at a Moderate Price

Lining made of spiegelized iron, self-locking, no bolts through shell. Scoop feed, trunnions, equipped with spiral feed and reverse spiral on discharge end.

The capacity and horsepower can be varied from above, depending on the steel ball charge, and is based on 1¼ to 2-inch feed, and product 12-mesh and finer.

Capacity, Tons per Hour	Diameter Mill, Feet	Width Mill, Feet	Revolutions per Minute	Horsepower	Balls to Charge, Pounds
20	6	6	25	65	9,000
13	6	4	25	43	6,000
17	5	6	27	55	7,000
15	5	5	27	45	6,500
12	5	4	28	40	6,000
10	4	5	29	38	5,000
5	4	4	32	15	2,500
3	4	3	32	12	2,300

The Morse Bros. Machinery & Supply Company
1732 Wazee Street, Denver, Colorado

Reliability Means Continuous Service

If you could insure your power line against damage and deterioration without paying any premium, by the use of CARBO STEEL POLES and still keep the cost of service below that of wood construction, do you think you can afford to use wood?

CARBO Steel Poles
and
Fencing Systems
for Industrial Plants

solve many problems of the mining and engineering world. Both systems obviate the use of concrete because of Patented Features.

Let us show you Increased Economy and Service are obtainable with our systems

CARBO STEEL POST CO., 783 Rand McNally Bldg **CHICAGO**

Advertised machinery is the most dependable.

INDUSTRIAL LOCOMOTIVES

A locomotive to justify its cost must start the required load and keep it going.

The right amount of the right material must be provided in the right place.

Each and every part must be sure to fit not only the locomotive for which it was made, but every other locomotive of the same size and design. Spare parts must be instantly available, made so well as to go into place without a machine shop.

We have a number of standard sizes of locomotives in stock and can make immediate delivery.

AMERICAN LOCOMOTIVE COMPANY

30 CHURCH STREET, NEW YORK

McCormick Building, Chicago, Illinois. A. Baldwin & Company, New Orleans, La.
Dominion Express Building, Montreal, Canada.
N. B. Livermore & Company, San Francisco and Los Angeles, California.
Northwestern Equipment Company, Seattle, Wash., and Portland, Oregon.

SUPERLA BRAND *Represents New Process Friction Reducing Oils*

Superla Brand affords the Highest Degree of Lubrication at Minimum Cost.

SUPERLA CYLINDER OIL
SUPERLA ENGINE OIL
SUPERLA DYNAMO OIL
SUPERLA TURBINE OIL
SUPERLA MACHINE OIL

Every Drop Counts

Their Adoption by Leading Industrial Works of the World is the Strongest Proof of Their Lubrication Value and Power Saving Properties

Also Polarine FRICTION REDUCING MOTOR OIL

The Standard Oil for Motors

Manufacturers of MINING AND DOMESTIC CANDLES and MINER'S SUNSHINE

STANDARD OIL COMPANY

(AN INDIANA CORPORATION)

CHICAGO, ILLINOIS

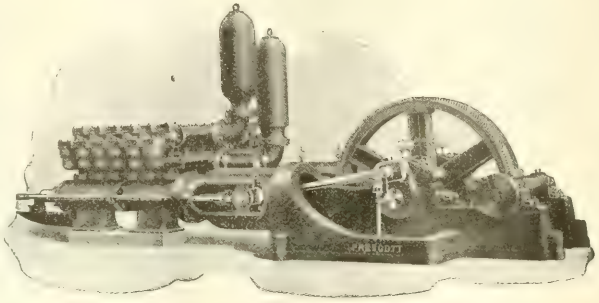
PRESCOTT
MINE PUMPS

IF your mine is electrically equipped, it is to your advantage to get fully acquainted with PRESCOTT Duplex Power Pumps before making your installation.

We are specialists on Mine Pumps and every machine turned out by us embodies our knowledge of what mine pumps must do, gained by years of experience in this field.

PRESCOTT Pumps are operating under every condition to be found in a mine, and our experience and success enables us to recommend to you the proper machine for your particular requirements.

Send us your specifications and ask for copy of our CATALOG P 105-33.

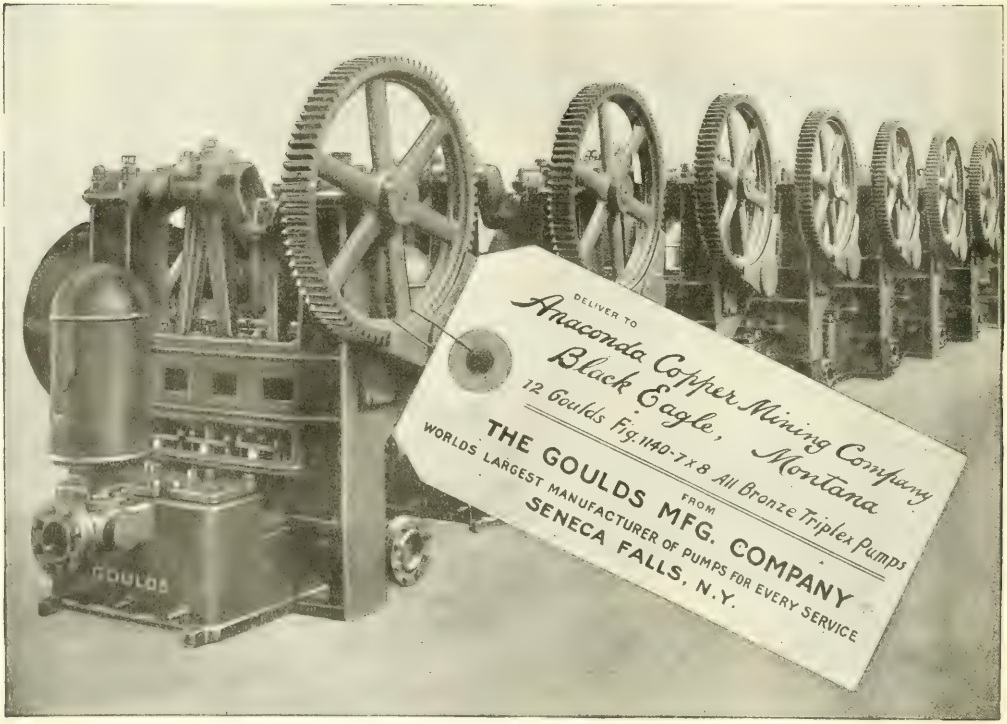


Worthington Pump and Machinery Corporation

Successor to Fred. M. Prescott Steam Pump Co.

115 Broadway, New York **Works: Milwaukee, Wis.**

Branch Offices in all Principal Cities. P188.4


DELIVER TO
Anaconda Copper Mining Company
Black Eagle, Montana
12 Goulds Fig. 1140-7 x 8 All Bronze Triplex Pumps
FROM
THE GOULDS MFG. COMPANY
WORLDS LARGEST MANUFACTURER OF PUMPS FOR EVERY SERVICE
SENECA FALLS, N.Y.
GOULDS

Advertised machinery is the most dependable.

Announcement

The New Deister Simplex Rougher, The New Deister Simplex Finisher, The Deister Simplex Slimer and The Deister Cone Baffle Classifier

embody all the very latest Deister Inventions and Improvements in Concentrators and Classifiers. They are positively the best machines on the market today.

This was impressively demonstrated in a recent competitive test made at Juneau, Alaska. The Alaska Juneau Gold Mining Company tested our Simplex Rougher, Simplex Finisher, and Cone Baffle Classifier very thoroughly and gave us the entire order for their new mill, consisting of 48 Roughing Tables, 102 Finishing Tables, and 75 Classifiers. Our Simplex Rougher handled 225 to 250 tons and at the same time made a clean concentrate, our Simplex Finisher handled 75 to 100 tons, and our Cone Baffle Classifier handled 115 tons per day.

The Alaska Treadwell Gold Mining Co. tested our Double Deck Simplex Slimers and found that each machine could handle 50 tons successfully, this being equivalent to 4 Vanner loads in their mill.

NOTE: The reason for this large capacity and perfect control of the line of separation on our **Simplex Tables,** resides in our patented **Duplex Plateau** which consists of several steps or rises along a diagonal line intermediate the dressing zone and the main concentrating portion of the deck.

We wish to make it clear to all who are not intimately acquainted with the personnel of the Deister Machine Company, that Emil and W. F. Deister are exclusively and permanently engaged with this company.

Remember, the **Deister Simplex** Tables are the only ones that embody the **latest** Deister Inventions. Look for the words **DEISTER SIMPLEX** in all our advertisements from now on.

We ask you to give us a trial order.

DEISTER MACHINE COMPANY

INCORPORATED JULY, 1912

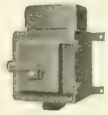
HOME OFFICE AND FACTORY: 1933-2003 East Wayne Street, FORT WAYNE, IND., U. S. A.

LONDON OFFICE: No. 1 London Wall Bldgs., LONDON WALL, E. C.

AGENTS: WILLIAM L. REEDER, 410 Consolidated Building, Johannesburg, So. Africa TAKATA & COMPANY, 2 Yeiraku-cho, Nichome, Kojimachi-ku, Tokyo, Japan

No Precaution Has Been Omitted

TO MAKE THE



MINE-A-PHONE

Water Proof *Gas Proof* *Fire Proof* *Fool Proof*

and Immune to the Effects of Blasting at the Working Breasts or Gas Explosions.

These are the features that make for SAFETY-FIRST and are original with the MINE-A-PHONE, the telephone designed especially for use underground.

Our Bulletin No. 2000 gives the details of construction so clearly and simply that the reasons for the above will be plain to every practical Mine Manager, Superintendent and Engineer. Let us send you a copy.

Stromberg-Carlson Telephone Mfg. Co.

Rochester, New York, U. S. A.

Chicago Los Angeles San Francisco Seattle, Wash. Toronto, Ont.

Tell the advertiser you saw it in the Mining and Engineering World.

AMERICAN BRIDGE COMPANY
HUDSON TERMINAL-30 CHURCH STREET, NEW YORK

Manufacturers of Steel Structures of all classes particularly BRIDGES AND BUILDINGS

Open Hearth Furnace Building,
Edgar Thompson Steel Works.

SALES OFFICES

NEW YORK, N. Y., 30 Church Street
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PITTSBURGH, PA. . . Frick Building
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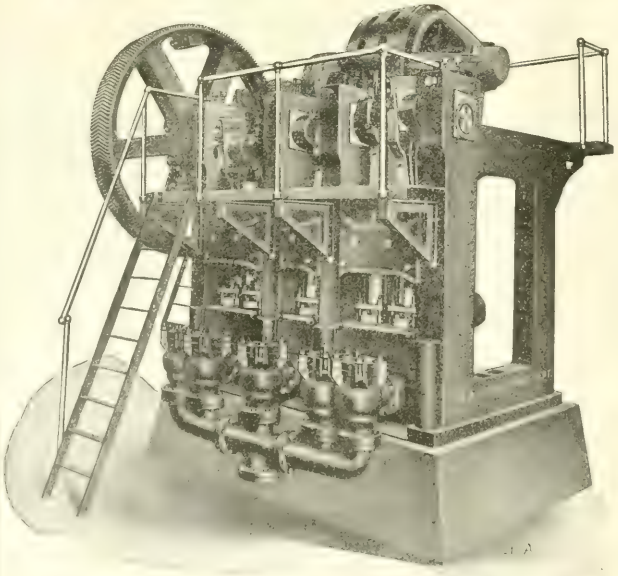
Buffalo, N. Y. . Marine National Bank
Cincinnati, Ohio. Union Trust Building
Atlanta, Ga. . . . Candler Building
Cleveland, Ohio . Rockefeller Building
Detroit, Mich., Beecher Ave. & M. C. R. R.
CHICAGO, ILL., 208 South La Salle St.
St. Louis, Mo., Third Nat'l Bank Bldg.
Denver, Colo., First Nat'l Bank Building
Salt Lake City, Utah, Walker Bank Bldg.
Duluth, Minn. . . . . Wolvin Building
Minneapolis, Minn., 7th Ave. & 2nd St., S. E.

Pacific Coast Representative:
U. S. Steel Products Co. Pacific Coast Dept.
SAN FRANCISCO, CAL., Rialto Building
Portland, Ore. . . . . Selling Building
Seattle, Wash., 4th Ave. So. Cor. Conn. St.

Export Representative:
United States Steel Products Co., 30 Church St., N. Y.

The Aldrich Quintuplex Mine Pump



Original
Distinctive
Efficient

Illustration shows pump for heavy mine service, with motor mounted on top, which gives the greatest factor of safety against flooding.

Pump Data sent on request.

THE ALDRICH PUMP COMPANY
Allentown, Pa., U. S. A.

NEW YORK
82-92 Beaver St.

CHICAGO:
636 McCormick Bldg.

PITTSBURGH:
2218 Farmers Bank Bldg.

Advertised machinery is the most dependable.

Continuous Operation of the
SENN PAN MOTION CONCENTRATOR

gave the following average results:—

83.5 % Saving when handling 20.59 Tons per 24 hrs. of fines from cone treating fine jig slimes.

72. % Saving when handling 32.8 Tons per 24 hrs.
77 % of Values in −65 mesh; 25 % in −200.
Only 362 gals. water per ton of ore in feed.
Only 94 gals. dressing water per ton of ore.

150 Tons of Unclassified 3 m/m (about 6 mesh) feed; only 362 gals. total water per ton.

Unequalled Capacity and Recovery. Least Water.

Write for complete data and state your conditions fully.

SENN CONCENTRATOR COMPANY

SAN FRANCISCO OFFICE: FIRST NATIONAL BANK BUILDING

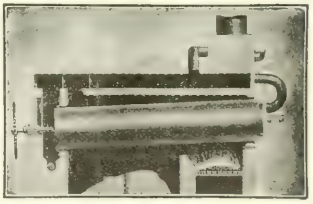
J. E. Robertson, El Paso, Texas — Stimpson Equipment Co., Salt Lake City, Utah

Our Business is to REDUCE YOUR HANDLING COSTS

Our Automatic Skip Hoists reduce the cost of handling materials to a minimum.

Our Conveying and Elevating Machinery has a minimum cost for upkeep.

We make the largest variety of Mechanical Dryers in the world.



We also make a large line of Crushers, Feeders and Pulverizers.

THE C. O. BARTLETT & SNOW CO.

CLEVELAND, O. — 50 Church St., N. Y.

SPRINGS—Flat or Coiled

Any required shape or size. Made to sample or specification. Oil-tempered Crucible Cast Steel Springs for Machinery a Specialty

THE WM. D. GIBSON CO., Manufacturers
N. W. Corner Huron and Kingsbury Sts., CHICAGO

NO RIVETS—
Strong and Economical

Specially adapted for Water Supply and Ventilation Pipe in Mines—also for Dredging and Irrigation.

STANDARD SPIRAL PIPE WORKS, Rockwell and W. 48th Sts., CHICAGO

Limits

Now being treated successfully by Continuous Counter-current Decantation:—

The largest plant—1000 tons per day.
The smallest plant—50 tons per day.
The richest grade—$30.00 per ton.
The poorest grade—85% per ton (Slime tailing)

The following is taken from the annual report of a prominent Canadian company after installing Continuous Decantation:—

"The results of our mill operation have been more than satisfactory. The Continuous Decantation process has not only been justified, but has proven remarkably adapted to the ores in our district, and has been adopted by all of the important mines in our vicinity. The average extraction for the year is 97.26%. The cost of milling per ton—based on the tonnage treated—is lower than that of other cyaniding methods."

Write us for Bulletin No. 7.

THE DORR COMPANY

ENGINEERS

Successors to The Dorr Cyanide Machinery Company

New York:
17 Battery Place

Denver:
1009 17th Street

London, E.C.:
16 South Street

Electrical —Mine— Insulation

must possess qualities not affected by acid water, heat or foul air.

Stern-Condensite Weatherproof Sockets have the approval of the U. S. Government and the Underwriters Laboratories.

Stern-Condensite presents a finished appearance like hard rubber, but is mechanically stronger and is guaranteed to resist acid water or heat. Just the kind for mines.

***A trial** will prove its superiority over rubber or other compositions.*

Manufactured Only By.... **Dickinson Manufacturing Co., Springfield, Mass.**

KURT R. STERNBERG, Treas. and Gen. Mgr.

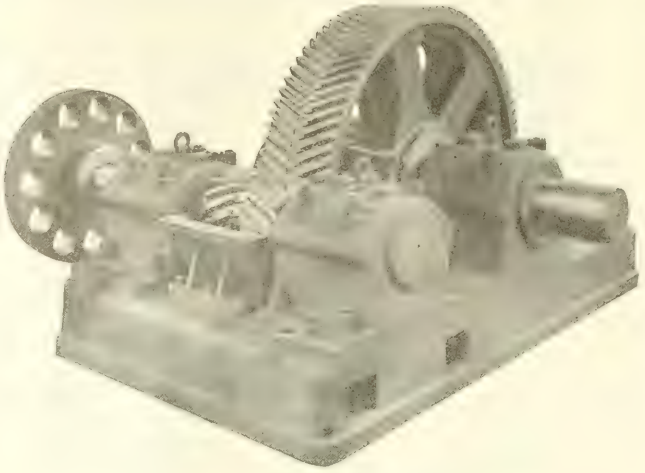
Advertised machinery is the most dependable.

Fawcus Cut Herringbone Gears

FAWCUS Standard Herringbone Gear Drives

Horsepowers 50 to 1500
Ratios 3:1 to 12:1
Stock patterns Standard drawings
Universal application
Complete with "Fawcus" Flexible Couplings

For Electrifying Engine Driven Hoists



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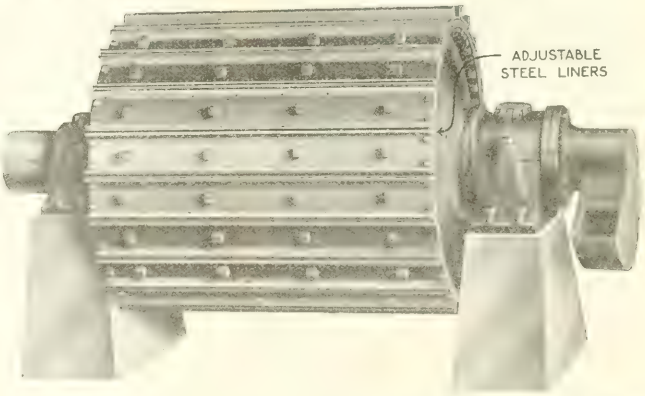

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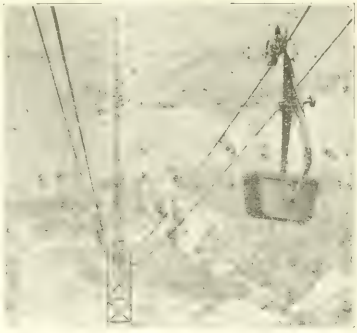

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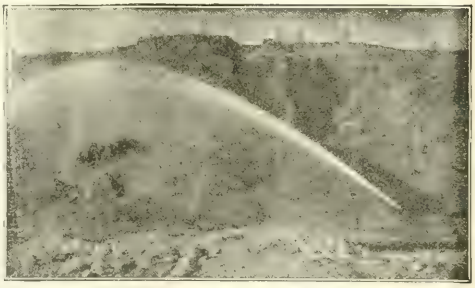

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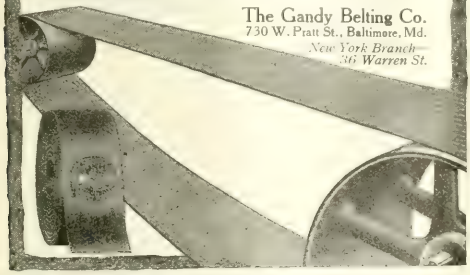

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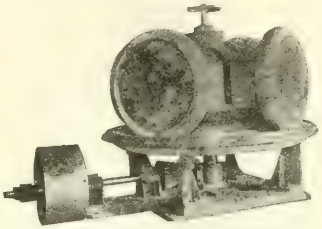

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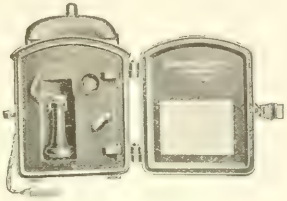

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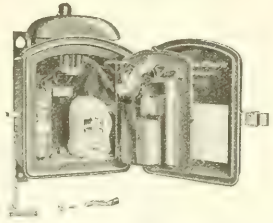

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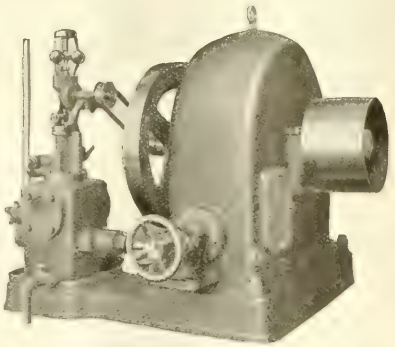

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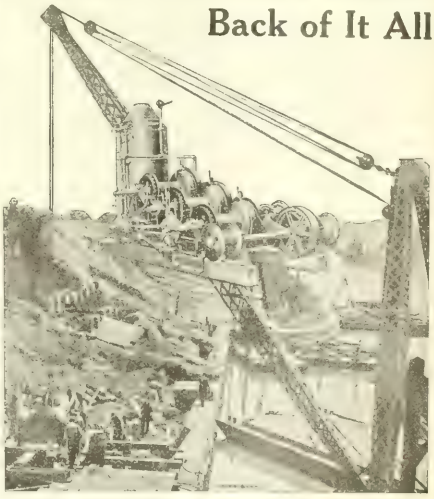

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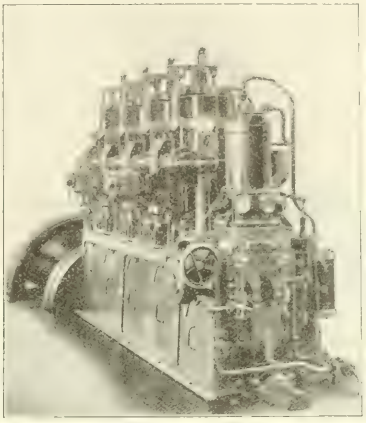

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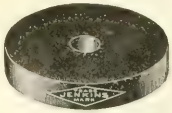

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No. 23. Vol. 44. CHICAGO June 3, 1916.

GENERAL PANORAMIC VIEW OF THE OATMAN DISTRICT.

Present Development of the Oatman District of Arizona

By W. A. SCOTT.

[*In order to give our readers the exact status of conditions as they exist in the Oatman gold camp of Arizona, Mr. Scott, associate editor and western field representative, made a special trip to the district. The result of his investigations will be found interesting.*—ED.]

A mining map of the Oatman, Ariz., mining district prepared by Haff & Colwell, engineers, shows there are 120 sq. miles in Oatman district, there being 50 sq. miles of surveyed claims. About 20% of the latter area is surveyed for patent.

There are 105 new headframes and hoisting plants in the district, and the most of them are active. There are 8 or 10 electric plants, a number of semi-Deisel oil engines, all the others being gasoline engines, in which the lighter distillate, called "tops," is used. As shafts reach a depth of 600 to 1000 ft., the electric power is likely to increase.

In giving an account of new development the various new undertakings will be taken in order of their importance.

The United Eastern Mining Co. opened the ore body at a depth of 365 ft., from No. 1 shaft, and now has working levels from the 300, 400 and 500-ft. stations. This development discloses a width of vein 3 to 40 ft., the ore body being a continuous ore shoot. The vein has a dip to the northeast, the original shaft, No. 1, having been sunk in the hanging wall. Water was struck at the 500-ft. level, and about 10,000 gals. are being baled out per day through No. 1 shaft. The new 3-compartment shaft being sunk farther out in hanging wall, now at a depth of 140 ft., is expected to cut the vein at about 1000 ft., and is being timbered with 10 by 10 timbers. This is to be the main working shaft, and is equipped with an Allis-Chalmers double-drum, electric hoist, operated by a 150-hp. motor, and has a Cutler-Hammer solenoid brake. Other equipment here consists of a 900-cu. ft. Ingersoll-Rand air compressor, driven by another 150-hp. electric motor; this will be good for 12 drills of the kind and capacity to be used. Power is secured from the Desert Light & Power Co., Kingman. The new plant also includes a Leyner drill sharpener. The intention is, when the new shaft reaches sufficient depth, to make connections with the old workings at the 400, 500 and 600-ft. levels. In the vein, the gangue consists of a mixture of quartz and calcite, with no sulphides. The value of the ore runs $20 to $25, the ratio of gold and silver being about 2 ozs. gold to 1 oz. silver. The gold occurs as finely-divided, free particles, disseminated through the quartz and calcite, and is considered an ideal cyaniding ore. The site for the mill, which is under construction, is

on the sidehill sloping northwesterly from the new shaft. Data concerning the mill equipment have been previously published in Mining & Engineering World. A new pumping plant, to bring in a water supply to the property, is practically completed. It consists of a Dow triplex plunger pump, operated by a 30-hp. electric motor, installed at springs on the opposite side of the range. This requires a lift of 700 ft., through a 3½-mile line of 4-in. steel pipe, to tanks at the summit. J. A. Burgess, formerly of Tonopah and Fairview, Nev., is now general superintendent of the property; Philip Wiseman, Los Angeles, is president of the company. The directors are: Seeley W. Mudd, Frank A. Keith, Philip Wiseman, J. L. McIver, W. K. Ridenour, D. C. Jackling, R. C. Nowland, R. I. Rogers, and Geo. W. Long.

The Big Jim Gold Mining Co. has a well-developed property on the same ore zone as the Tom Reed and United Eastern. Work was begun Aug. 1, 1915, and there is now a 500-ft. shaft, with working levels extending from the 400 and 500-ft. stations. The ore body was opened by a crosscut on the 400-ft. level, showing a vein of ore 38 ft. wide; it was opened by another crosscut on the 485-ft. level, where the same width of vein was found. Ore on the 400-ft. level assayed an average of $7.44; other samples taken after drifting some distance ran $60. Assays taken from the drift at 480-ft. level averaged 35% higher than those at 400. The shaft has two compartments from the collar to the 400-ft. station; below that it is a 3-compartment shaft. New equipment lately installed consists of an Ingersoll-Rand 700-cu. ft. air compressor, electric driven; this will operate 7 Ingersoll-Leyner drills. There is also a new drill sharpener. The hoist is operated by a 25-hp. Fairbanks-Morse gasoline engine; but it is stated that heavier hoisting equipment will soon be required. Water was struck at 400-ft. level, and about 85 gals. per minute are being pumped by compressed air. A 4-stage Cameron centrifugal pump is being put in position. The Big Jim is under the management of A. G. Keating, who states that the company is securing data and estimates on milling equipment, as it is evident the mine soon will require such a plant. The ore characteristics of this mine are similar to those of Tom Reed and United Eastern. A force of 40 men is employed, and the property has four buildings for hoist, air compressor, blacksmith shop and change room for the miners.

The Pittsburgh, Murdock and Oatman Southern are all being developed under the management of S. R. Porter, who has been in the district 12 years. These properties are financed by parties in the east, for whom R. B. Lamb is consulting engineer. The Pittsburg, having a 300-ft. shaft and 800 ft. of drifts, is being equipped with a 1000-cu. ft. air compressor and a 60-hp. gas engine for hoisting, and a boarding house and several cottages are being built. Considerable amount of ore has been exposed on a vein believed to be parallel to that of United Eastern. The Oatman Southern, situated south of Boundary Cone, is being equipped with a new gasoline hoist and air compressor, over the shaft. Development has opened high-grade gold ore. A force of 20 men is employed. The Murdock, on the Black range lode, has a 150-ft. shaft in the hanging wall. It has a gasoline hoist, air compressor and other equipment. The plan is to sink to 500 ft. depth. Supt. Porter states that $6000 per month will be spent in developing each of these three groups, which means a combined force of about 100 men.

The San Francisco Gold Mines Co., controlled by Capt. Jno. A. Hassell, C. E. Miller, Jno. O. Knight, F. M. Sayre, Los Angeles, and L. P. Morel, Oatman, has three claims, on which is a vein considered the same as that on the Fessenden and South Merit of Oatman United. Development is proceeding under direction of Fred. W. Crosley, E. M. Sinking is in progress, the equipment consisting of a 30-hp. West Coast gasoline hoist and an Ingersoll-Rand air compressor. The idea is to sink to a depth of 600 ft. Samples taken by trenching on the surface showed low assays in gold. The sinking here is in the hanging wall, and at a depth of 300 to 400 ft. crosscuts will be driven to the vein.

Boundary Cone Mines Co., Los Angeles, has a well-developed, well-equipped property, situated about 2 miles southwest of Oatman. The shaft has a depth of 785 ft., from which there are drifts in ore on the 250, 550 and 750-ft. levels. The vein, which is irregular in dip, stands between andesite walls, except at the 550 level, where one wall is rhyolite. The ore assays from $1 to $40 gold on the 450 and 550 levels; many nuggets of gold have been found in the quartz. Ore from the 750 level assays from a trace to $10 and $12 in gold. A considerable tonnage of ore has been blocked out. Equipment includes a 40-hp. gasoline hoist and a 340-cu. ft. air compressor. A new drill sharpener is to be put in.

The Gold Dust Mines Co., and Gold Key Mines Co., having adjoining groups lying west of Old Trails, are being developed under direction of J. C. Denton, manager and F. F. Brush, mining engineer, and Richard Lloyd, superintendent. Several years ago the Gold Dust was equipped and partly developed. There is a 500-ft. shaft in the hanging wall, crosscuts from which have been driven to the vein from each 100-ft. station, except at the 400. On the 200 there is 1135 ft. of drifting, and a like amount on the 500. The vein varies in width from 8 to 12 ft., the free-milling ore occurring in a system of lenses. A second shaft, sunk at a higher point, is on same vein, and has a depth of 270 ft. There is a parallel vein on the Gold Key, in which there is higher grade ore, containing coarser gold; this is considered the same as the vein of Boundary Cone mine. Development is by means of an inclined shaft, corresponding to the dip of the vein. A new gasoline hoist and air compressor have

TOM REED GOLD MINE AT OATMAN.

SURFACE PLANT OF UNITED EASTERN AT OATMAN.

been put in place; also, a new headframe. A steel skip is operated in the shaft for hoisting. The mill erected several years ago on the Gold Dust by the Orion Mining Co., a holding company for the other two, was not successful, and probably will be re-equipped to adapt it to present requirements

The Carter Mining Co., controlled by J. L. Munds and associates, Kingman, is developing the Carter property near Old Trails, the work being in charge of W. H. Munds, superintendent. An inclined shaft has been sunk to a depth of 350 ft. in the hanging wall of vein. Stations have been cut out at depths of 50, 150, 250 and 350 ft., and from these there is about 1000 ft. of lateral development. The foot wall is said to be trachyte, the hanging wall being the characteristic andesite of the district. The vein width ranges from 6 ins. to 19 ft., averaging, perhaps, 3 ft. The silicious gold ore, typical of the district, is found here, assaying about $8. Equipment consists of a 20-hp. Witte gasoline hoist, Sullivan air compressor, and a 4-hp. Buffalo blower.

The Sun Dial Gold Mining Co., A. F. Carper, superintendent, is developing a group of claims 3 miles northwest of Oatman. This property is provided with the typical plant of equipment for exploration and initial development. A shaft is being sunk at the junction of cross veins. Interested in this are Donald Barker, Geo. Nolan, Harry Andrews and A. F. Carper. The surface here is 300 ft. lower than at Oatman, and water has been found at 50 ft. depth, making conditions favorable for reaching ore at 200 ft.

Chicago Syndicate Co. is developing its group of 7 claims, situated 5 miles westerly from Oatman. It was formerly known as the Red Reef group. The work is in the hands of C. R. McCollom, managing engineer. Among the interested parties are D. E. Hunter, David Blankenhorn and B. M. Wotkyns, all of Pasadena; and J. J. Mitchell, of Illinois Trust Co., Chicago, and Edward Swift of Swift Packing Co. The fissure vein, having a strike northwest, and a dip of 72°, has a calcite-quartz filling, the vein outcrop showing a width of 15 ft. on one branch and 12 ft. on another. A 2-compartment, vertical shaft, 4 by 4½ ft., is being sunk on the hanging-wall side, expecting to cut the vein at a depth of 225 ft. The shaft, now down 40 ft., is being timbered with 8 by 8 timbers. A 15-hp. West Coast gas hoisting engine has been put up, also a Sullivan air compressor to be belt driven from the hoist. A heavier plant will be required as soon as water level is reached. This camp is 1000 ft. lower than Oatman, and a wet shaft is anticipated. This work is essentially for exploration purposes, but ore may be reached at 200 ft.

The Times Mining Co. operations are under direction of Z. J. Bergeron, president; W. F. Gray, vice-president and manager; Frank H. Lathrop, secretary-treasurer. This group of 240 acres covers three parallel veins 6300 ft. on their strike. One shaft has reached a depth of 180 ft., and two others are being sunk. The main vein is about 40 ft. wide at the 150-ft. level. The ore contains gold in calcite, fluorspar and quartz. On the Martin gulch side of the group, where a tunnel is being driven, a crosscut of vein showed a width of 124 ft., and this contained an ore shoot 18 ft. wide. The ore is of excellent grade. The property is equipped with 25-hp. gasoline hoist, a 15-hp. gas engine for operating a 12-kw. generator, and still another to operate an air compressor. The company is laying a 4-mile line of 4-in. pipe to convey water from springs by gravity to the camp. This company employs 40 men and has a townsite situated 5 miles northwest of Oatman.

The Black Range mine, situated in the Boundary Cone section, 6 miles from Oatman, is controlled by D. P. Wright, L. P. Morel and others. They have opened a contact lode, between andesite and an altered rock. Between walls are segments of clay, altered rhyolite and a vein of quartz, bearing free gold, averaging high grade. A 300-ft. shaft has been sunk on the hanging wall, the hoisting being done with a gasoline engine. They operate two air compressors, one for drill power and the other for pumping. Water level was found at 300 ft., where ore was struck. Mr. Wright will soon be figuring on milling facilities.

Midway Mining & Milling Co., Los Angeles, is developing a group of claims covering one mile on the strike of the old Moss vein. These holdings lie between the Moss and Mossback groups. The Moss was operated in early days. The vein is a fissure in a porphyry formation, and has a defined outcrop throughout. It has a dip of 85°. A shaft was started 6 ft. off the vein in the hanging wall, and quartz containing small values was found at 30 ft. The vein proper, it is figured, will be opened in the course of this sinking at 80 to 100 ft. depth. A 25-hp. gasoline engine and a 3-drill air compressor have been put in. The shaft has two compartments and is being timbered. Suitable buildings have been erected, and 16 men are employed. Part of the work consists of laying 2½ miles of 1½-in. pipe to convey a water supply by gravity from springs situated 400 ft. higher than the camp. The Moss-Midway fissure is a gold-bearing vein, as has been demonstrated by workings in the Moss and Mossback groups. The purpose is to sink 500 ft. on the Midway. The officers are as follows: Erasmus Hoff, president; A. J. Mead, vice-president; W. D. Palmer, secretary; J. E. Eichelberger, manager.

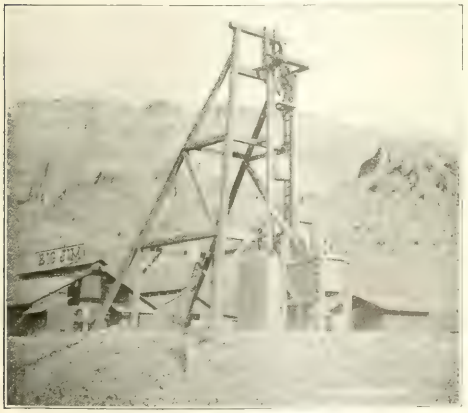
Oatman Queen group, a mile west of United Eastern, is being developed under direction of Lewis Hind. Over a 170-ft. incline shaft is a 25-hp. gasoline hoist and a 340-cu. ft. air compressor. The vein is 30 ft. wide, a general average value of the ore is said to be close to $12. The plan is to sink to 300 ft. depth and then crosscut and drift. The No. 5 Cameron pump in use here raises 2500 gals. of water per 24 hours. W. E. Moore is in charge of the work.

Combination Mines Co., R. L. Johns, manager, and W. P. Mahoney, superintendent, has sunk a 250-ft.

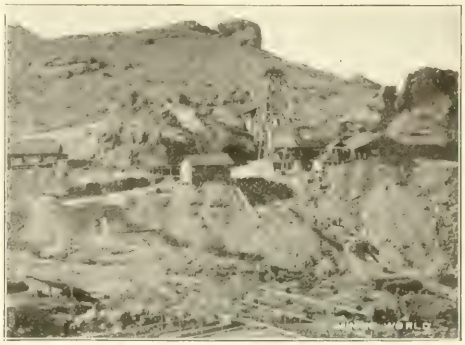
TIMES GROUP LOOKING EAST.

shaft on a group of claims lying 800 ft. east of the Big Jim. It is equipped with hoist and air compressor. Sinking is going on at the rate of 6 ft. per day, the plan being to go down to a depth of 500 ft. before crosscutting to the vein.

Oatman Amalgamated Gold Mining Co. is controlled by the following: G. W. Long, president; Chas. Prochnow, vice-president; J. T. Burns, secretary-treasurer and manager; Del Sherer, W. D. Rodin, D. A. Byrne, Geo. Babbit, C. A. Jones and J. L. McIver. Their group of 34 claims lies in the northern part of the district, northwest of Gold Road group. The 150-ft., 2-compartment shaft is to be continued to a depth of 500 or 600 ft., then a crosscut will be driven to the vein. Thus far about $30,000 have been spent on equipment, buildings and underground work. This includes hoist, compressor, pumping plant, tanks and a 1000-ft. pipe line for water



BIG JIM HEADFRAME. VIEW FROM



THE GOLD ROAD PROPERTY.

supply. A report on the property was recently made by Etienne A. Ritter, mining engineer.

Oatman Leader group of 3 claims covers a vein on which considerable work has been done. In this, surface ore assays show gold values. Hoisting and compressor equipment have been installed. Among those interested are W. F. Gray, J. C. McCormack, H. D. MacMaster, E. Bollinger and E. Shotmiller.

Oatman-Crescent, near Black Range mine, is controlled by Geo. W. Pierce and associates. It has been financed in New York. An engine and air compressor are being set up for exploration work. A depth of 300 ft. is to be attained by driving a 450-ft. crosscut tunnel to the vein. Pierce has 15 men at work.

Esperanze Exploration Co., controlled by Geo. W. Long, J. P. Loftus, J. L. McIver, F. H. Lathrop and others, has equipped for sinking 400 ft. before crosscutting to the two veins on the group, situated in Crouse canyon, east of Boundary Cone.

Oatman Syndicate, owned by J. Parke Channing and associates, New York, has a 400-ft. shaft, from the base of which crosscuts have been driven south to the lode. The outcrop of the vein here is perceptible for some distance, there being other locations farther east of that of Oatman Syndicate, one of

COUNTRY SURROUNDING GOLD ROAD CAMP.

which is the Nellie. This vein strikes northwest-southeast, and is southeast of Boundary Cone peak.

Wrigley Exploration Co. has extensive locations covering Highland Chief and Crown Point lodes, having an east-west strike through Boundary Cone spur. Under direction of C. H. James, E. M., equipment is being put in position for driving a crosscut tunnel to open these and other parallel lodes at a depth of 600 ft. The equipment consists of a 75-hp. semi-Deisel oil engine and an Ingersoll-Rand air compressor. J. M. Heck, who located the claims and sold them to the Wrigley Exploration Co., says there are four east and west veins cutting through this mountain spur. The tunnel is to be 6 by 7 ft., and only a little timbering may be required. A well-equipped camp is being established, and water is being piped there from Black Range mine.

"Jack" is the New Monarch Among Minerals in the Central States.

For many years the value of the copper mined in the central states has exceeded that of zinc, frequently by millions of dollars, owing entirely to the greater value of the copper, for the quantity of zinc produced has been larger. Under the stimulus of extraordinary prices for both copper and zinc in 1915 the mine output of copper in the central states increased 50,650 tons and that of zinc 47,857 tons. The value of the copper produced increased from $21,865,043 to $46,494,969, an unusual increase, but not sufficient to retain its pre-eminence, for the value of the recoverable zinc jumped from $17,139,264 in 1914 to $53,540,472 in 1915, "jack" thus running $7,000,000 ahead of copper. Under ordinary conditions the production of 222,548 tons of lead, valued at $20,919,512, an increase of 18,703 tons in quantity and of $5,000,000 in value, would have attracted considerable attention. An increase in value of one-third is unusual, but it appears small compared with that of either zinc or copper.

The production of silver in the central states is always relatively unimportant. The output in 1915 amounted to 647,553 ozs., valued at $328,309, of which 585,933 ozs. was derived from copper mines in Michigan.

The total value of the silver, copper, lead, and zinc mined in the central states increased from $55,171,306 in 1914 to $121,283,262 in 1915, or about 120%.

The high price of copper in 1915 benefited few companies or individuals except those interested in the comparatively small number of mines in the Lake Superior district in Michigan, for that state produced nearly all the copper credited to the central states. Missouri reported 402,160 lbs. of copper, which was derived mainly from the dressing of lead concentrates.

The average selling price of lead was less than a cent a pound more in 1915 than it was in 1914, so that lead mining was more profitable chiefly for the 5 or 6 large companies having mines in the disseminated lead region in southeastern Missouri, which produced 83% of the output of the central states. The increase in average price did not stimulate lead mining in other regions, as the only other notably increased output was due to more extensive mining of the "sheet ground" in the Joplin region, which carries considerable lead. In 1915, however, the smelters desired high-grade zinc concentrates free or nearly free from lead. Such concentrates were purchased at a base price much higher than that paid for concentrates containing over 1% of lead. Moreover, high-grade zinc concentrates frequently sold for more than double the price paid for galena concentrates, so that owners of "sheet ground" and "soft ground" had no reason to rejoice over the lead content of their ore.

The largely increased and high price of zinc concentrates created a healthy boom in nearly all districts. The profits of the big operators were abnormal, but hundreds of mines worked by small companies or individuals shared in the general prosperity. Miners' wages were raised and mining machinery and supplies were liberally purchased at advanced prices. With zinc concentrates doubled and more than doubled in value any mine that would not yield a profit was indeed worthless. Producing properties or old mines with shafts and drifts that could be unwatered, where old concentrating plants could be repaired or new ones quickly built, were eagerly sought. Old dumps at abandoned mines attracted men and boys who made good wages by culling the waste rock. Tailing mills were run profitably on material that would not yield any profit when zinc concentrates sold for less than $50 a ton.

The salient facts relating to zinc and lead mining in the central states in 1915 were the building of new mills and roasting and separating plants in the Wisconsin-Illinois region; the increased output and the better recovery made by "flotation" in the disseminated lead district in Missouri; the more general use of thickeners, classifiers, and tables and the vastly larger yield from the "sheet ground" in southwestern Missouri; the development of the new mining territory near Picher and Cardin, in the north Miami field in Oklahoma; and the active prospecting and mill building and the large increase in shipments of zinc carbonate in Arkansas.

The final figures showing silver, copper, lead, and zinc mined in the central states in 1915 are given by states and by regions in a report prepared by J. P. Dunlop, a copy of which can be obtained upon request addressed to the Director, U. S. Geological Survey, Washington, D. C.

The Manganese Products Co., 35 Wall street, New York, incorporated in Delaware, April 1, 1916, has taken over the Kennedy manganese ore mines, located about 5 miles from Lipscomb, Augusta county, Va., formerly owned and operated by the Steel Ores Co. of Virginia.

Wolframite and Scheelite at Leadville, Colo.

By R. S. FITCH and G. F. LOUGHLIN.*

The latest of the many types of ore bodies to be recognized in the famous district of Leadville, Colo., is that of gold-bearing quartz-pyrite veins containing the tungsten minerals wolframite and scheelite. The first of this material recognized was sent by Mr. Fitch to the Survey in the fall of 1914, and more material was obtained by him in August, 1915. There has been no opportunity to study the geology of the deposit in detail, but the presence of the tungsten minerals is believed to be of sufficient interest to warrant this preliminary description.

The ore from which this material was taken is being mined in a number of leases on the Ibex and adjoining properties to the south, on Breece hill. Production at present is from Nonie, Ontario, and Capitol claims, while practically identical material in every way except value, has been opened in a shallow shaft on the St. Paul group. The ore production ranges from 200 to 250 tons per day and average controls on car shipments would average 0.8 oz. gold and 0.5 oz. silver. Shipments go to all Colorado smelters except that at Durango. The minimum value for profit under present smelting contracts is about $12 per ton. A large tonnage of ore of lower grade is known to exist and for its treatment a 200-ton mill is proposed. The gold is thought to be largely free, possibly coating the fractures in the pyrite crystals, since it has been determined that the large unfractured crystals, to be described later, are of low value.

Country Rock.

The country rock in the vicinity of the deposits includes Weber grit and gray porphyry, and the veins may cut both. In the specimens studied, the wall rock is so much silicified and pyritized that its identity is somewhat doubtful, but it is certainly grit in part, whereas no porphyritic texture could be identified. The two thin sections studied of the wall rock are both of grit, silicified and pyritized. The grit is composed mostly of subangular grains of quartz and a few grains resembling completely sericitized feldspar, in a fine matrix of sericite and minute quartz grains. Secondary quartz is also present in veinlets or impregnating clusters and grains. It can usually be distinguished from primary quartz by the absence in it of strain effects. A few larger flakes of sericite, up to half a millimeter in length, are present and are clearly of secondary origin. Pyrite is scattered prominently through the rock in grains up to 2 mms. in diameter. The larger grains of it are more or less intergrown with secondary quartz and sericite.

Close by, or between, some of the veinlets, the grit may be so thoroughly recrystallized as nearly to lose its identity, even under the microscope. The numerous originally small grains of quartz and sericite have been transformed into relatively few larger grains of the same minerals. These larger grains of quartz and sericite are more or less intergrown with each other and with pyrite, relations identical with those among the same minerals in the vein proper.

The veins, or vein zones, strike N. 33° E. and dip 68° W., and so far as developed lie wholly to the east of the Weston fault. Their relations to this fault have not been determined. In the specimens studied they fill anastomosing fractures enclosing fragments of wall rock, and contain numerous vugs into which the well-crystallized termination of the vein minerals project.

The worked payable portion forms a shoot of ellipsoidal outline. Its rough dimensions at the 500 level are 120 ft. in width and 130 ft. in length; on the 900 level, 40 ft. in width and 150 ft. in length. On the 2d level, for a distance of 40 to 50 ft., a well-defined footwall can be seen which is accompanied by a thin gouge. Elsewhere on this level the drift curves while following the pay material and shows clearly the elliptical shape. In general, distinct walls are not apparent, and the pay ore grades into material of exactly similar appearance but of low value. Tungsten minerals are distributed throughout the zone of higher-grade ore, and persist downward with the shoot, their percentage increasing markedly with depth. The scheelite, however, is more abundant on the upper levels, and the wolframite on the lower.

The principal minerals in the veins are quartz, pyrite, wolframite and scheelite. Sericite, in parallel growth with quartz, forms films along the fracture walls.

Quartz.—The quartz occurs mostly in typical colorless crystals, up to 2 ins. in length, which line cavities and also protrude through, or penetrate pyrite crystals. In certain places where the crystals are crowded together, the quartz has a rather massive, milky appearance. In only one specimen was any dense, or cherty, quartz noted. This formed a short veinlet about 2½ ins. long, and evidently represented an extreme degree of silicification along a small fracture. It was closely associated with the well-crystallized quartz, and contained minute pyrite crystals. It was doubtless formed at the same time as those minerals.

Pyrite.—Pyrite is well distributed throughout the veins, and occurs mostly in groups of rather large crystals. Single crystals of cube form have been found with edges 5 ins. long. Where crystal faces have formed, the pyritohedron and cube prevail in combination, while small faces representing the trapezohedron, diploid, and octohedron beveling edges and corners of the crystal are also present. An interesting phase been the repeated development of narrow pyrito-

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hedron faces on a large cube face giving, especially where corroded, a "Gothic window" shape of marking. Besides the parallel growth with quartz already mentioned the pyrite exhibits in places a marked intergrowth with wolframite. Parallel growth with scheelite, though noted, is not common.

Wolframite.—Wolframite is not prominent in every specimen examined, but tends to occur in masses of dull brownish black color, which terminate abruptly in the vein against pyrite and quartz, or against scheelite. These masses contain many small cavities, where some faces and angles of wolframite crystals have developed, but these are generally so corroded that no adequate idea of the crystal form can be gained. In one specimen, however, there is an isolated crystal over half an inch long, projecting into a small vug. The crystal is of flat rhombic or wedge-shaped outline. The broad faces are those of the clinopinacoid *b* (010) as they are parallel to the perfect cleavage. The narrow faces are the orthopinacoid *a* (100) and probably the steep dome *t* (102). No other faces are represented on this crystal. The surfaces of small crystals in other specimens are too much corroded to permit the determination of crystal faces. Some faces that are not corroded are rather strongly striated, the striations probably lying parallel to the prism zone. The hardness is apparently as low as 3, since even glistening surfaces are scratched by calcite. This low value may be due in part to the corrosion of the mineral, but may also be characteristic of the manganese tungstate hübnerite in contrast to the iron tungstate ferberite, whose hardness is given by Dana as 5 to 5.5. The luster, though dull for the masses as a whole, is submetallic on cleavage surfaces and uncorroded crystal faces. The color, though prevailingly brownish black, is dark reddish on thin, translucent cleavage flakes. Thin flakes under the microscope are red to yellow. The streak is chocolate brown to reddish brown. No quantitative analysis of the mineral has been made, but qualitative tests prove it to contain considerable amounts of managanese and tungsten. These results agree with the low hardness (3) and partial transparency in indicating that the mineral belongs to the hübnerite or manganese tungstate part of the wolframite series, as contrasted with ferberite, the iron tungstate, which is harder (5) and opaque.

The wolframite masses contain numerous small grains of pyrite, some of which are intimately intergrown with wolframite. The intergrowths consist of bladed or tabular individuals of wolframite in diverging groups, and separated one from another by thin layers of pyrite. Wolframite comprises two-thirds to three-fourths of the intergrowth. Wolframite is alse intergrown on a small scale with scheelite in the central parts of certain scheelite crystals.

Scheelite.—The scheelite occurs in localized aggregates, some closely associated with masses of wolframite, others with pyrite and quartz. In some places, massive scheelite is surrounded by massive pyrite; in others, scheelite crystals, growing on quartz or pyrite crystals, line vugs. The crystals are imperfect doubly terminated pyramids of the tetragonal system, truncated by narrow pyramid faces of the second order. Pyramidal cleavage surfaces are distinct, though not prominent. The hardness lies between 4 and 5, the luster is resinous to adamantine, and the color is rather light brown in the larger crystals to pale yellowish in small translucent grains. The crystal surfaces show no conspicuous effects of corrosion. They are free from intergrowths other than those with wolframite already mentioned, and grow upon all the other minerals in the veins.

Paragenesis.—The relations already described, of the vein minerals to one another indicate that, while there were overlaps in the periods of growth, the general order of deposition was as follows: (1) Sericite, quartz, and pyrite in parallel growth, the sericite forming only at the beginning of the stage; (2) pyrite and wolframite, the latter predominating; (3) very little pyrite, a little wolframite and abundant scheelite, the scheelite continuing to form after the other two minerals had ceased. According to Hess this seems to be the usual paragenetic relation of scheelite.

The Alaska-Juneau Mill.

The crushing and concentrating mill being built at Juneau by the Alaska-Juneau Gold Mining Co., after designs and under direction of Bradley, Bruff & Le Barthe, engineers, Hobart building, San Francisco, is to have a capacity of 8000 tons per 24 hours, and probably will be ready for operation by Jan. 1, 1917. The plant is to be housed in a structure of steel and reinforced concrete, upon a site close to Gastineau channel, at Juneau. The mill is 3 miles from the mine; the ore will be transported by electric haulage over a surface tramway of that length. The mill is being equipped with crushers, rolls, ball mills, tube mills and tables. The initial crushing will be followed by pulverization in 8 by 6-ft. ball mills of special design, in which forged chrome steel balls are used. The final grinding is to be in tube mills, 6 ft. diameter and 12 ft. long. The concentration will be by Deister tables, manufactured by the Deister Machine Co., at Fort Wayne, Ind. These are to consist of both double and single-deck machines. The ores carry gold of the value of about $2 per ton, in a gangue of quartz and schist, the gold being associated with sulphides of iron and lead, with a little zinc. The ore bodies have been well opened by tunnels. The company's general manager is P. R. Bradley, formerly with the Treadwell mines.

The only producer of zinc in New York state in 1915 was the Northern Ore Co. Its zinc properties in St. Lawrence county were actively developed and a 200-ton mill was in successful operation in the latter part of the year. It is probable that at least one other company will operate in 1916.

The Flotation Process at Goldfield, Nevada

By A. H. MARTIN.

Flotation plants are treating approximately 200 tons of ore daily at Goldfield, Nev., and within 3 months from 650 to 900 tons will be handled every 24 hours. The Goldfield Con. Mines Co. has placed orders for equipment capable of treating 500 tons per day, and the capacity of the unit of the Nevada Metals Extraction Co., operating on low-grade material from the old Florence dumps, will likely be increased from 150 to 400 tons. With its 50-ton experimental unit the Goldfield Con. is testing the efficiency of the process insofar as it concerns the regular milling ore, and successful results will be followed by the building of a flotation plant capable of treating 1000 tons of ore per 24 hours. Tests on the ores have also been made by the Yellow Tiger, Diamondfield Black Butte and other companies, and indications are favorable for erection of several flotation units at Goldfield within the year.

While the units operating at the Goldfield Con. and Florence mines employ different machines, the net results have been practically the same. Each plant has demonstrated its ability to recover approximately 92% of the gold content and nearly 99% of the copper. At times the percentage of gold extraction has exceeded 94% and the metallurgists believe the gold recovery may be better than the preliminary tests indicate. Ore from the Florence dumps average $5 to $6 per ton, but the product treated by the Goldfield Con. is stated to have been of higher grade. The steady run of the 150-ton unit of the Nevada Metals Extraction Co. proves total operating costs will not exceed $2.25 per ton, facilitating profitable production of huge tonnages of ore that have hitherto been valueless in the Goldfield district.

In all the developed mines of the district, and particularly in the Goldfield Con. group, Atlanta, Florence and Jumbo Extension, extensive deposits of copper-gold ore have been opened in the lower levels. As copper has an adverse influence on cyanide, the Goldfield Con. has kept from the mill feed all ore containing more than one-half of 1% copper. Large quantities of fairly high-grade ore have been shipped to custom smelters, an example followed by the Atlanta and Jumbo Extension companies. High mining costs, coupled with heavy freight and smelting charges, prohibited production of any but the best grade ores, and little has been sent out that average under $15. Engineers familiar with local conditions are authorities for the statement that large quantities of base ore assaying $4 to $12 are exposed in numerous properties, and are now available for profitable production for the first time in the history of the district.

The Callow method is employed by the Goldfield Con. at its 50-ton experimental plant and will be used in the 500-ton unit, which is scheduled to go into commission early in June. The crushed ore from the stamps passes to Dorr classifiers, separating into slime and sand. Slime passes directly to the flotation machines, and the sand goes to a tube mill for further grinding. At the head of the tube mill oil is introduced. The mixture at present used consists of 80% coal tar, 17% creosote, 3% pine oil. Approximately 3 lbs. of oil are used per ton of ore, and the total oil cost will not exceed 8 cts. to the ton, according to present indications. Callow variable speed oil feeders are employed to deliver oil to the tube mill charge.

Tube mill discharge is returned to Dorr classifiers for further separation, and the classifier-overflow is delivered to the Callow flotation cells by centrifugal pumps. Tailings from the first cells are passed to a second line of cells, from which tailings are delivered to a third battery. Tailings from the third cells are passed over Deister slimers before flowing to waste. Concentrates from the flotation cells are passed through a cleaner-cell, which improves the grade of concentrates. Tailings from this cell are turned back to the circuit at the head of the primary cell.

The flotation concentrates are roasted and leached with sulphuric acid, and the copper precipitated on iron. The charge is next neutralized with lime and treated with cyanide to recover the gold. All concentrates will be treated at the local plant of the Goldfield Con., thus eliminating one of the problems ordinarily confronting the user of flotation—a satisfactory method of handling concentrates.

The Callow pneumatic flotation cells used at the 50-ton unit are 9 ft. long by 2 ft. wide, equipped with sloping bottom and divided into compartments. A porous canvas mat covers the bottom, and through this compressed air is forced at a pressure of 5 lbs. per sq. in. For the 500-ton unit the company has ordered 24 Callow cones. Should the experiments on the milling ore prove satisfactory, all ore will be treated by flotation, and the cyanide process discarded. In this event the mill will still handle fully 1000 tons per day at an estimated saving of $180,000 per annum. Cost of the 500-ton unit will not exceed $18,000, and it is evident all projected changes can be made at a comparatively light outlay.

The 150-ton plant of the Nevada Metals Extraction Co. at the Florence mine employs Janney flotation machines, and the flotation froth is produced by agitation instead of compressed air, as at the Goldfield Con. unit. Each machine is actuated by an individual motor, and oil is fed into the emulsifier above the first cell instead of into the tube mill. After passing the final cleaner cell the concentrates are dewatered by a vacuum filter and delivered to a drying plate. Here it is heated to remove moisture and then packed in bulk in strongly-lined cars for shipment to smelters. Con-

centrates thus far shipped are said to average around $70.

This plant is operating on ore from the old Florence mine dumps, on which the Nevada Metals Extraction Co. holds a 3-year lease, containing approximately 55,000 tons, said to average $5 to $6. It is probable that ore from the deeper levels of the Florence mine will be treated as soon as the capacity of the plant has been increased to 400 tons per day. This can be done by the addition of a tube mill and minor accessories to the plant.

The success of flotation on Goldfield ores has brought about reorganization of many local companies, and several properties idle for years are about to be worked. The leading companies are also prosecuting work in the deep levels for the first time since the complex ore came in strongly.

The Nelson Ore Separator.

An improvement in ore separators, of the type known generally as dry washers, is claimed by Ivan E. Nelson of Santa Clara, Calif. (U. S. patent 1,179,744). It consists of a series of screens and riffles with means for collecting fine gravel and sand to assist the elimination of the gold, by jets of air or suction pipes creating air jets.

Referring to the accompanying drawing, 1 denotes the base of the machine and 2 a suitable ore hopper. The hopper 2 feeds to an elevator belt 3, which is

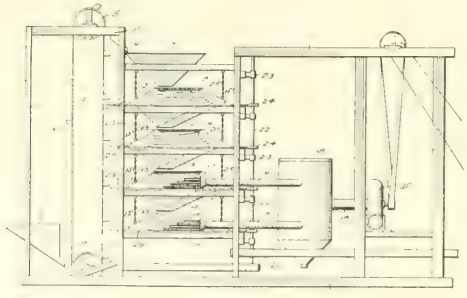


FIG. 1.

movable over wheels 4, journaled on the frame members 1′. The belt 3 has a plurality of ore buckets which are adapted to deliver ore to a chute 6, which leads to a hopper 7. The hopper 7 is supported over a screen 8, and the screen 8 is supported over a second screen 9, and the screen 9 is supported over a third screen 10, which third screen is supported over a collecting plate 11.

The screen 8 is arranged over a hopper 12, which is adapted to deliver material passed through the screen 8 to the screen 9, which screen 9 is arranged over a hopper 13, which delivers material passed through the screen 9 to the screen 10, which screen 10 is arranged over a hopper 14, which delivers material passed through the screen 10 to the collection plate 11.

The hoppers are covered by hoods 15′ on which riffle plates 15 are arranged, each riffle plate being provided with an inwardly curved upper edge. The riffles are arranged in steps, as shown in Fig. 1. Between the riffles on the hoods adjacent the two upper screens mercury is arranged to collect gold in the usual way, while over the hoods adjacent the lower screen and collecting plate suction tubes or pipes 16 are arranged, their inlet ends being provided with hoods 17, which are open at their ends and at their bases and are supported above the hood or plate.

The pipes 16 are connected to the air tank or suction chamber 18 which communicates by a pipe 19 with the interior of the suction casing fan 20, which is operated by a suitable belt or other means. The tank 18 is provided with a suitable delivery point or end, whereby the sand can be taken from the tank.

A vibrator shaft 22 is journaled at its ends to the frame 1 and is driven by a belt 21. Brackets 23 hold the shaft 22 rigidly on the frame 1. Eccentrics 24 are mounted on the shaft 22 and eccentric straps 24′ are arranged on said eccentrics and are connected by means of the rods 24″ with the yokes 29^a, the terminals of which connect with vertical arms or rods 29^b which are secured to the frame 29 for supporting the screens and plate 11. The frame 29 is connected to parallel angle bars 28. Horizontal supports 25 are arranged on the frame 1 and angular rods 27 are secured to said supports, and on the upper free ends of said rods rollers 26 are arranged. These rollers 26 are adapted to normally bear against the outer surfaces of the angular bars 28 carried by the screen frames 29. When the shaft 22 is rotated the eccentrics will impart a vibratory movement to the screens and plate 11 and the rollers 26 will transform this movement from a normally circular like orbit to a more irregular one, whereby the ore will be more effectively agitated.

The ore falling from the hopper 7 will be separated partly by the screen 8, the larger stone passing over the screen and falling into the spaces between the riffles, thus permitting the mercury to come in contact therewith, the ore passing through the screen will be again subjected to the separating action of another screen, with a finer mesh, and the ore passing through the second lower screen will be subjected to the separating action of the third lower screen 10, and the ore passing through the still finer openings of this screen will fall upon the collecting plate 11, designed principally to collect sand. The material falling into the spaces betwen the riffles on the screen plate 10 and on the collecting plate 11 will be drawn into the tank 18 by the pipes 17, the terminals of which are disposed on different planes and which are of different lengths, as shown in Fig. 1. In this way the use of water is dispensed with.

Copper exports from Atlantic ports for the week ended May 18 totaled 4093 tons. Since May 1 they were 11,069 tons, against 24,658 for the same period last year.

Co-Operative Effort on Part of Each Employe

By JOSEPH P. HODGSON.*

Since about 70% of the total cost of mining is due to underground work which is out of sight, it is essential that expenditures should be made here to the best advantage. A great many mistakes have been made which were expensive, but perhaps these have not even been detected by mine owners. In the future these may be minimized to some extent, especially if there is co-operative effort on the part of each employe.

I have been interested in this subject for some years and have tried to deduce principles and methods. These have proved highly advantageous and may also be of help to others. Some corporations, like the U. S. Steel and the Cleveland-Cliffs Iron Co., have done a great deal in this field by having stated meetings of their organizations, with the view to interchanging ideas among their men and educating them along the lines of concerted effort.

Since no man knows all about the various branches of mining, it is advisable that frequent meetings of the operating department be held for the interchange of ideas and that all members of the organization have an opportunity to express themselves on the various subjects. It has often been found that in discussions between heads of departments, foremen and bosses many valuable suggestions may be obtained which promote the best interests of the company. The method regarded as the most conducive to co-operative effort and pursued by the organization is to analyze and develop the different phases of various mining subjects at regular meetings.

In the latter half of 1912 the Copper Queen Con. Mining Co. gave monthly dinners to the men in the operating departments. Those who attended were superintendents, foremen, shift bosses, engineers, geologists and heads of all departments, making a total of about 75 men. After the dinner lectures were given on subjects which presented the most difficult problems. The purpose of the meetings was to get the men of the different departments acquainted, talk over the various problems and standardize methods as much as possible.

At first the meetings were formal and those who attended them had little experience in the way of presenting and advancing ideas, but after a few meetings the men became better acquainted with each other and a systematic plan for speaking on various subjects was mapped out. It soon became commonplace for the men to express their opinions freely. Since the grade of the ore was one of the most perplexing problems, Smelter Superintendent Rutherford delivered the first lecture on the cost of smelting ore and waste. Later Dr. Douglas spoke on the early history of the Copper Queen, and Walter Douglas spoke of some changes which led to profit sharing. A Sunday excursion to Douglas was arranged and the importance of the grade of the ore was further explained on the ground at the smelter.

The following subjects outline the papers and discussions that were delivered from the time that the monthly dinners were started up to the present:

Compressed Air; Mine Fires; Ventilation in Metal Mines; Mining Methods, Progress in Efficiency; Safety First, Costs, Etc., in Lake Superior Iron and Copper Mines; Costs of Mine Supplies; Lagging in Drifts and Stopes; Method of Covering Timber Compartments for Maximum Ventilating Purposes; Candles and Carbide Lights, Efficiency and Costs; Standard Raises, Manways and Timber Compartments; Standard Sizes of Timber; Electrical Costs Underground; Standardizing Steel and Machines; Geology of Bisbee Ore Deposits, Field Excursion; Stoping Methods at Morenci, Miami, Ray and Inspiration.

On July 1, 1915, the Copper Queen Mining Conference was formed for the purpose of instructing shift bosses, engineers and others in the essentials of mining. This department is an expansion of the mine foremen's dinners. At the dinners the papers and discussions are brief and of a general nature, and half the evening is devoted to entertainment, while at the mining conference papers are discussed in greater detail and problems receive further study. Attendance at the conference is optional; however, it is evident that all who attend receive instruction beneficial to themselves as well as the company. Instruction is imparted in the form of lectures, reviews, discussions, readings, results of investigation in mining methods, etc. Lectures are given every Tuesday evening and the meeting lasts one hour. As the shift changes every 2 weeks, lectures are repeated for the benefit of those who are on the night shift. Those who attend are the same representatives as mentioned at the mine foremen's dinners. About 75% of the men in the operating department attend the mining conference. The following subjects were taken up during 1915:

Geology, Classification of Ground; Types of Machine Rounds; Time Study in Drilling; Bonus System; Caps and Fuse; Powder; Drilling Machines; Steel; Milling.

The present outline of subjects for discussion during the next 5 months (Jan. 1 to May 31, 1916) is as follows:

Mine Ventilation; Sampling; Safety First; Mine Timber; Water Lines; Costs of Mine Supplies; Leaching; Electricity; Smelting; Management.

All the men in an official capacity have become well acquainted with each other. The monthly as

*Arizona meeting, September, 1915.

well as the weekly meetings usually bring forth fresh ideas, many of which are carried out from time to time. For instance, the best methods of putting in manways were suggested and worked out by bosses; also methods of repair work were first suggested by bosses and foremen. The central blacksmith's shop is the product of many suggestions by a number of those in the operating department. The same is true of the central sawmill, the ventilation system, the daily stoping costs, etc. Whatever has been accomplished in the way of reduction of costs or the working out of new things, we believe has been due, in a large measure, to the efforts of the members of the various departments in planning and working in harmony, which is really the result of co-operative effort.

War's Effect on Prices of Mining Supplies.

How the European war has effected mining costs is evidenced by the table in the fifth annual report of the Hollinger Gold Mines, Ltd., showing the advance in prices for supplies, etc., paid by the company during the year 1915:

	Costs August, 1914.	Present costs.	Advance. %
Mine supplies—			
Connecting wire, per lb	$ .50	$ .70	40
Dynamite (40%), per cwt	13.10	19.70	50
Dynamite (50%), per cwt	14.60	22.45	53½
Detonators, per M	12.60	39.70	215
Fuse (safety), per case	23.95	28.20	18
Fuse (time), per M	5.40	10.25	90
Rails, per ton	43.00	57.50	33
Shovels, per doz	7.60	9.00	18
Steel (drill), per lb	.07	.09	30
Steel (hollow), per lb	.12	.16	33
Track spikes, per keg	3.25	4.50	39
Track bolts, per keg	6.00	9.00	50
Mill Supplies—			
Borax, per lb	.11¾	.17¼	47
Cyanide, per lb	.15	.16	7
Crucibles	.07½	.13	74
Cams, each	20.26	23.20	14½
Cam shafts, each	83.00	90.00	8½
Lead acetate, per cwt	8.10	14.30	75
Liners (tube mill), per lb	.03¼	.03½	8
Litharge, per cwt	5.65	12.60	127
Lead (pig), per cwt	5.65	10.06	78
Muriatic acid, per cwt	1.70	2.93	80
Pebbles (Danish), per ton	22.03	26.80	22
Shoes and dies, per cwt	4.85	6.55	37
Zinc dust, per lb	.06⅜	.27	427
Zinc spelter, per cwt	6.48	17.25	276
General—			
Machinery and parts			10 to 40
Electrical equipment			20 to 50
Corrugated iron			50
Iron and soft steel			50
Tool steel			500
Pipe			60
Nails			40
Lubricating oils			10
Fuel oil			51
Gasoline			65

It is reported that aluminum may become one of the products of the Consolidated Mining & Smelting Co. of Canada, which now smelts and refines lead, silver, copper, zinc and gold. The siliceous ores of its Rossland, B. C., mines, notably the Le Roi, carry up to 18% aluminum in treatable combinations. The company's new West Kootenai hydro-electric and electrolytic zinc projects place "Canadian smelters" in a favorable position for aluminum production which requires abundant and cheap hydro-electric power.

Copper exports from the Atlantic ports for the week ended May 4 totaled 897 tons. Since May 1, 897 tons, against 2992 tons in the same period last year.

Motor Trucks for Road or Rails.

An unusual order for trucks was recently placed with the Locomobile Co. by the government for a complete company of thirty 3-ton Riker trucks. The order was the first that has been awarded for anything larger than that to the Jeffrey for the 2-ton vehicles. The order was placed Monday morning and was filled

MOTOR TRUCK ON RAILWAY TRACKS.

in every detail Tuesday afternoon. The trucks were loaded on a special train in the Erie Railroad yards, Jersey City, and were shipped directly through to San Antonio, Tex. It is understood that these trucks will go into immediate service on the Mexican border. Forty-one mechanics and drivers accompanied the trucks. This order follows a demonstration given a few days ago, when this motor truck ran from Columbus, N. M., to El Paso, Tex., over the rails of the El Paso & Southwestern railway system, in 93 miles, averaging a little better than 19 miles per hour. The truck carried 20 soldiers, with their complete equipment, and on arrival at El Paso was derailed and driven up the main street. The truck left El Paso the same evening and made the return trip to Columbus, N. M., without incident. The flanged rim device was invented and developed by A. L. Riker, chief engineer of the company.

Iridium powder, a by-product of the wet process of platinum refining, is converted into iridium phosphide and back into metallic iridium to be used in the manufacture of gold pen points.

The Hercules Powder Co. has let a contract for the erection of a kelp plant at San Diego, Calif., to cost over $500,000.

An Emergency Escape-Way for Mines

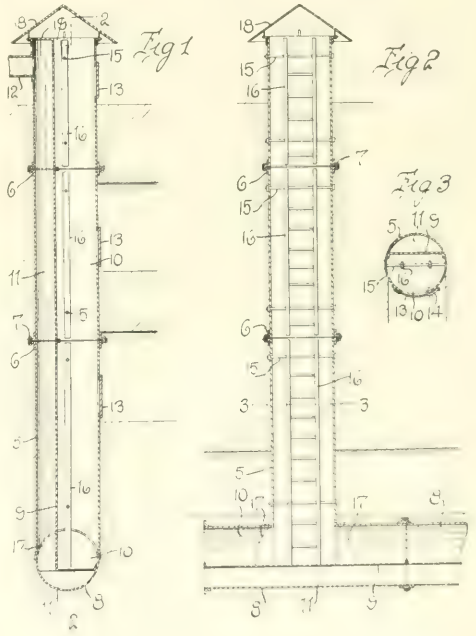
In this day of safety-first and accident prevention the introduction of any device looking to the safeguarding of mine workings is of interest. Along these lines is the emergency escape-way for mines invented by Josiah Hoskins of French Gulch, Calif. The device includes a main escape shaft to which any desired number of laterally extending shafts or conduits leading into the drifts or gangways of the mine may be connected. The main escape shaft being provided with suitable doors at the various levels through which the workmen may find entrance to the interior thereof, the shaft is provided with a ladder or equivalent means for affording an easy means of ascent to the ground surface.

Another important object of the invention is to provide means in connection with the emergency escape-way for withdrawing foul air and gases from the mine so that the workmen will not be overcome.

Referring to the drawing, 5 designates the main vertical escape shaft which is constructed in a plurality of sections provided on their opposite ends with collars or flanges, indicated at 6. Suitable packing is arranged between the flanges of the adjacent pipe sections and said sections are securely bolted together, as at 7, to provide hermetically sealed joints between the several sections of the shaft. The lower end of this vertical pipe or escape shaft is similarly jointed or connected to a laterally extending horizontal shaft or conduit 8. By means of T or elbow joints, additional sections may be connected to this laterally extended pipe and said pipes or conduits 8 extended into every room of the mine workings. The main vertical pipe or shaft 5, as well as the horizontally disposed pipes or conduits 8 are divided by the longitudinal extending walls 9 to provide the main compartments 10 therein and the relatively small compartments 11. The smaller compartments 11 of the vertically and laterally extending pipes or shafts are in communication with each other, as clearly shown in Fig. 1, to provide an unobstructed passage through which foul air and gas may be drawn. For this purpose, the upper end of the compartment 11 of the vertical escape shaft 5 opens to one side of the pipe and through the same, the pipe 12 being connected which extends to a suitable draft furnace. The passages 10 and 11, at the ends of the laterally disposed pipes or conduits extending into the various rooms of the mine are also open and in communication with each other, so that the foul air and gas will be drawn from the mine through the passages 11 and fresh air drawn from the mine through the passages 10.

The vertically disposed pipe or shaft 5 is provided at the several working levels of the mine with hinged doors 13 whereby access may be had to the compartment 10 of the shaft. These doors are equipped with suitable snap fasteners or locking devices, indicated at 14, so that, after the workman has entered the compartment 10, the door may be closed to securely seal the door opening and prevent the entrance of foul air or gas to the shaft.

Bolts 15 extend diametrically through the walls of the vertical main shaft 5 and through the longitudinal bars of the ladders, indicated at 16. These ladders may be made in sections of any desired length and the lower section extends downwardly into the compartment 10 of the lateral pipe or conduit 8. The opposite edges of the division wall 9, extending from the main shaft 5 in this passage of the lateral shaft, are sloping or inclined, as at 17. Over the upper end of the main shaft 5 which extends above the ground surface, a suitable hood 18 is mounted so as to prevent dirt or other foreign matter dropping into said



shaft and filling the lateral shaft or conduit 8 at the lower end of said main shaft.

In the accompanying drawing, only one of the main escape shafts 5 is illustrated; but any desired number of these escape shafts may be provided as the mine workings may be more or less extensive. The several pipes or conduits of the escape-way are preferably constructed of heavy galvanized iron so that they will withstand the strains and pressures which may be devolved thereon. The transverse bolts 15, extending through the walls of the main shaft 5, serve to reinforce the same and also provide convenient means for supporting the escape ladders in

the chamber or compartments 10 of the shaft. The passage 11, through which the foul air is drawn, is closed at the upper end of the shaft 5 by means of the wall 19. The laterally extending pipe or conduit to which the vertical shaft 5 is connected, is preferably sunk below the ground level of the mine drift and covered with cement or other suitable material.

In actual use, when an explosion or other disaster occurs in the mine, the workmen enter the compartment 10 of the shaft 5 through the doorways provided, or enter the lateral conduits or pipes 8 extending into the several rooms of the mine, finally arriving at the lower end of one of the vertical shafts 5. The workmen then ascend the ladders in the vertical shafts, quickly reaching the ground surface. As before stated, as a forced draft is created through the several rooms or chambers of the mine and through the pasages 11, accumulations of gas will be withdrawn from the mine and fresh air continuously supplied, thus obviating the suffocation of the workmen before they can reach the vertical escape shafts.

Nearly $350,000 Worth of Potash Produced in 1915.

Potash salts were produced in the United States in 1915 to the value of $342,000, according to the U. S. Geological Survey. Though this figure is of interest as showing a small beginning in the domestic potash industry, it becomes of little importance if the total needs of the country are considered, for it represents a quantity consumed in less than a week under normal conditions.

The imports of refined potash salts in 1915 were 76,141 long tons, or slightly more than 25% of those in 1913, the latest normal year of importation. Imports of the potash fertilizers, kainite, manure salts and double manure salts, amounted to 20,427 long tons, or about 3% of those in 1913. Taking all the potash salts together, the imports in 1915 were about one-tenth of those under normal conditions.

In the report on the subject, W. C. Phalen states that potash was recovered within the United States as a by-product from the manufacture of Portland cement at Riverside, Cal. By-product potash from this source has yielded a considerable revenue, owing to the abnormally high price for these salts, and in obtaining it two other purposes have been subserved—first, the saving of additional material to be converted into cement, and, second, the elimination of the dust nuisance. At Riverside a discharge of 100 tons of dust a day over the surrounding orange groves has been prevented.

Potassium sulphate from alunite was first placed on the market late in October, 1915, by the Mineral Products Corporation, at Marysvale, Utah. The production has not been large so far, owing to the incidents connected with a pioneer enterprise of this character. Though certain foreign deposits of alunite have been worked for potash alum, this is the first recorded yield of potash salts as such from alunite. The product is of high grade.

The plant of the Potash Products Co., of Omaha, Neb., was established in the spring of 1915 at Hoffland, near Alliance, in the northwestern part of the state. During about half of the year the company obtained potash salts from the brine of an alkaline lake in this region.

In addition to output from the above sources, potash was marketed in 1915 from kelp obtained along the Pacific coast.

Experimental work on the production of potash salts from different sources was active during the year, and in places this activity has been succeeded by the construction of plants. Operations are in progress at Searles Lake and at Keeler, on the shores of Owens Lake, Cal. It is reported that one company is erecting a plant near Great Salt Lake and that another will soon be started at the south end of the lake. The by-product bittern at solar evaporation plants on San Francisco bay has also received some attention.

Another plant has been planned for the extraction of potash salts and alumina from alunite at Marysvale, Utah.

Manufacturers of Portland cement, having had their attention directed to a possible revenue from by-product potash, will not be slow in thoroughly investigating their raw material. Already the Security Cement & Lime Co., near Hagerstown, Md., is reported to be installing a plant for the recovery of potash salts.

Great activity has been manifested in experiments for the recovery of potash from the silicate rocks, such as feldspar and leucite, from the mica sericite, and from greensand. The expense involved in obtaining potash salts from these sources, together with the uncertainties with which manufacturers will be confronted and the keen German competition likely to be met at the close of the war in Europe, have tended to discourage chemical engineers and capitalists. However, in many laboratories researches have been in progress, some of which, according to reports, offer prospects of profitable commercial development if feldspars and other potash-rich rocks in sufficient quantity and purity can be found and made available.

A small quantity of potash salts was probably produced from these silicate rocks and minerals during 1915 and found its way into mixed fertilizers without intermediate refinement.

The Hydro-Electric Smelting Co., Ltd., has recently installed an electric copper smelter at St. Johns, New Foundland. Tests have been made on ore from the Little Bay copper mines with satisfactory results.

Copper exports from Atlantic ports for April totaled 19,980 tons, as compared with 16,822 tons in same month last year.

Notes on the Tungsten Ores of the Southwest

By H. H. TAFT.*

There is probably no mineral, commercially valuable, that takes so many forms differing so radically in appearance as the ores of tungsten. To the ordinary observer there is no connection except the unusual weight between the black ferberite and the light colored, sometimes white, scheelite. Every miner when shown the ore exclaims: I have seen that before, somewhere; then rakes over his memory for the place, and when he goes to it finds that it is something else, or that some one else is there. In visiting various tungsten mining districts one is impressed with two things: That there is very little mineral coming from places that have not been known to someone for a long time. A claim carrying hubnerite was patented in Colorado in 1877, and the specimens were discussed in scientific papers in the early eighties, yet is still unknown commercially; and the ease which the various minerals may be overlooked, scheelite particularly, would not be recognized in the course of an ordinary mine examination, unless made specifically for that mineral.

New mining regions pass through a cycle of development; experienced mine operators are a conservative lot, and are generally the last to take hold. One first sees those who stake everything in sight, and the consequent troubles that result from the skimping and avoidance of the legal assessment work; then the raw-hide period sets in, and it does one good to see the honest effort on the part of those whose means are very limited, but whose knowledge of ore dressing is good. In the Dragoon mountains in Arizona one can now see the almost forgotten rocker and pan and hand jigs augmented by gasoline driven crushers. The next stage is an old battery from some abandoned silver or, worse, gold mill, and a table. The loss in slimes in these mills is very great.

The prospector generally asks where to look for the ore, and is generally told to look for quartz veins in granite or pegmatite dikes. At White Oaks, New Mexico, the ore is in a crushed zone in rhyolite; at Hatchita the ore is in limestone. In the Dragoons the veins are quartz with a little fluorspar in granite, but the larger production is from placers, and they would suggest a country rock rather than vein mineralization, for the quartz veins are thin and the placer area is considerable. In the Wheatstone mountains near Benson, the ore is altered granite. The feldspar is not apparent to the eye, and the mica is light colored, instead of the not unfrequent magnetic iron; it carries ferberite. Near Nogales, where both wolframite and scheelite are found, the country rock is granite, or some of its modifications. In Sonora scheelite is occasionally seen in the concentrating copper ores at Nacozari, and farther south a green-colored scheelite comes from a copper mine. Again in Sonora ore identical with that of the Gigas is found; this same ore can hardly be distinguished from that from Bizma.

What is likely to prove an important tungsten area is the Gigas (quartz) mountains, near Arivaca, about 70 miles south of Tucson, Ariz., and 20 miles from the Southern Pacific railroad at Amada station. This is a range of hills rather than mountains, about 8 miles long and 2 or 3 miles wide; not over 800 ft. higher than the surrounding country, and having its greater elongation northwest and southeast. To the south flows Arivaca creek, that has surface water for 3 or 4 miles all of the year through. The stream on the northerly side only flows after a heavy rain, but has a considerable drainage in the gravel that can be reached by shallow wells.

The northwest end of the Gigas is granite, but the middle and southeasterly portion is of more recent eruptives, commonly known as porphyry, but not yet named. Through the range are a number of dikes of a dark green rock, perhaps diorite. The veins are of white quartz and are very prominent, dipping nearly vertically and strike with the mountain range. A secondary smaller series crosses the mountain. These veins are from thin seams to 5 or 6 ft. in thickness. Often there is a foot or two of quartz, a foot or two of country rock, a smaller seam of quartz, more country rock; another seam of quartz, etc. In all making a vein 10 ft. or more thick. The quartz is a typical gold quartz, carrying a small amount of the usual pyrites, chalcopyrites, galena, etc. Sometimes the country rock in the vein is mineralized better than the quartz itself.

The quartz veins at the northwest extremity of the range and for 3 or 4 miles east and south, are remarkable for the cystals of hubnerite; sometimes pin-head specks, and again beautiful crystals several inches long radiating like the fingers of an open hand, reminding one first of stibnite. These crystals are frozen to the quartz, making hand dressing impossible, unless roasting is resorted to. The present practice is to break (spall) the ore and pick out the best for shipment. There is a stamp mill equipped with tables at the lower end of the mountain.

At Campo Bonito, near Oracle, about 40 miles north of Tucson, is another tungsten area. The mineral is a salmon-colored scheelite. The principal vein is that of the Cody-Dyer Gold Mining Co., and is a fracture zone in the sedimentaries, limestone, shales, etc. The underlaying rock is granite, and in the neighborhood the same mineral occurs in quartz veins in granite and in granite diorite contacts.

Rigid laws do not apply to nature very well. While most of the tungsten is found in granite and with quartz, it is found associated with many other rocks.

*Denver, Colo.

Ferberite seems to favor small seams, and to make breccia fillings as in Boulder county, Colorado; hubnerite or wolframite, as crystals in quartz, neither mineral shows any regularity; a stope looks good today, tomorrow it may show no ore at all. Sheelite is the easiest mineral to pass over, and is the most irregular in its occurrence; it is never low grade in the sense of being intimately mixed with other minerals, but occurs pure in irregular masses or small fragments. Two or three hundred pounds have been found about 10 miles northeast of Nogales. The pits from which it was taken are the ordinary assessment holes dug in searching for gold-copper-bearing quartz. The mineral was in sharp-angled fragments of practically pure scheelite, imbedded in the soft granite of the veins. Even now one can pan the dumps and obtain particles of the mineral about the size of a grain of wheat. These particles, while the mineral is markedly crystalline, rarely show crystal faces, and are not rounded at all. In some instances they are probably pseudomorphs; more likely they are simply fillings of small rough vuggs.

It might almost be given as a rule that all unprofitable gold mines should be looked over for tungsten minerals. All valuable high-grade ore has a habit of being very irregular in its occurrence. One sees a great many unfortunate investments in the way of gold mines, that have been induced by occasional bunches or pockets of rich ore in fine-looking quartz veins, that do not yield enough low-grade material between the rich pockets to sustain the expense of operating, or a sufficient number of pockets to make selective mining profitable. It must be an agreeable surprise to some of the owners to find that they have a profitable tungsten mine.

All the tungsten ores are very brittle; crush the ore to ¼-in. and then jig or screen through a 20 or 30-mesh screen, and nearly all the mineral will be obtained, this fact and its high specific gravity, makes it possible to obtain a marketable product with hand appliances. It slimes badly. The writer has seen it floating like mosquito larvae on the water of a pool below a rocker where placer ground was being washed. The addition of a concentrating table to an old stamp mill is an economic plant in the matter of initial cost. If a stamp mill is to be used, slime equipment will be required. It is much better to reduce the proportion of slimes by using slow moving rolls. Eventually, when the price of tungsten declines, it will be found necessary to devise some plan to save the gold, thereby gaining an income from both metals. It appears sometimes that there is an inverse ratio between the gold and tungsten, when the tungsten content of the vein becomes low, the gold is likely to increase.

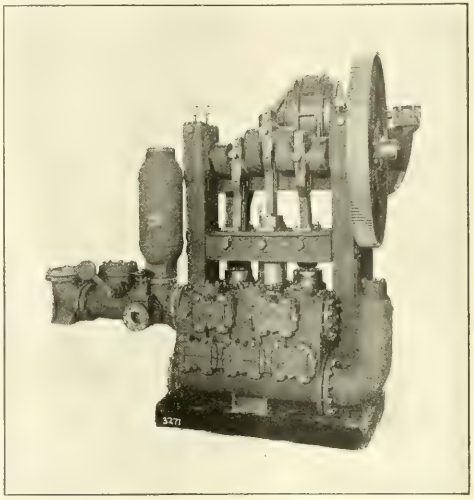
Sylvanite, sometimes called graphic tellurium, is a telluride of gold and silver. It sometimes contains lead and antimony.

An advertised brand is of itself a guarantee.

Modern High Economy Pumps for the Zinc Districts.

Companies in the lead-zinc mining districts, whose equipment in former years was notoriously crude and inefficient, are now installing pumps of the most modern type. The one shown in the cut, which has a maximum capacity of 1000 gals. per minute and was built for the Monmouth Zinc Mining Co., Hazel Green, Wis., offers an excellent illustration of this tendency.

It consists of a 11 by 12-in. Aldrich vertical triplex, outside-packed plunger electric pump of the divided water end type, single reduction, direct geared. Provision is made for mounting the motor on the top, as shown. The pump has also been furnished with two



ALDRICH ELECTRICALLY OPERATED PUMP.

pinions, one for giving a capacity of 850 gals. per minute at 58 rpm., and the other to deliver 1000 gals. per minute at 68 rpm., against a total working head of 240 ft. It is fitted with split hub and rim-cast steel, spur-cut gear, forged-steel motor pinion, cotboard bearing for extended motor shaft, check and by-pass valves, 12-in. suction and 8-in. discharge openings, bronze-lined throats, babbitt metallic packing, and a cast-iron pump base.

The pump is operated by a 75-hp., 3-phase, 60-cycle, 220-volt, General Electric squirrel cage induction motor. It has an extended motor shaft and is without bed plate or pulley, but complete with hand starting box. The synchronous speed is 600 rpm.; approximate full load speed, 570 rpm.

This installation is being watched with interest by the managers of other properties in the district and will undoubtedly be followed by others.

Pure metals are usually more malleable than their alloys.

Combined Hydraulic and Mechanical Classifier

A combination classifier devised by G. F. Sohnlein to prepare a pulp of tin ore for jigging is described in a paper prepared by him for the Arizona meeting of the American Institute of Mining Engineers. A Richards vortex classifier had been in use, but it clogged badly from fine vegetable matter in the water, and considerable slime was sent to the jig. Later a hydraulic classifier of the Anaconda type was provided, and its work was satisfactory if sufficient hydraulic water was used, but under these conditions a good deal of material that should have gone to the jig was carried into the overflow. If less hydraulic water was used, the sand product contained some slime, and the jig separation was not quite satisfactory. The desideratum was to obtain separation of part of the sand in the pulp under hindered-settling conditions without diluting fine material with too much water. In order to accomplish this, the apparatus shown in Fig. 1 was designed, consisting of a narrow wooden trough, in which the paddle wheel revolves. Details of the classifier can easily be gathered from the drawing. The tips of the blades are protected by ¼-in. iron strips fixed with two countersunk rivets. The strips last about 4 months and are replaced at small cost. The blades are cut from ¼-in. plate and bent in the fire. They are fixed to the rim of the pulley by three 1-in. by ⅜-in. machine bolts. The holes in the rim and those in the blades are bored from a template, and spare blades are kept ready so that but little time is lost in making renewals. The wheel is driven at the rate of 3 r.p.m. by a simple worm gear—in that case taken from an old vanner—which is directly belted to a line shaft. The feed is introduced into the trough near the bottom at O, after having been submitted to hydraulic classification in the pyramidal attachment P, in which an ascending current of water flows out of the pipe N. Consequently the material which is undesirable in the jig feed is floated off with the use of less hydraulic water than needed in an ordinary hindered-settling classifier because the slime that comes with the sand into the trough is separated by the paddle-wheel and flows over at A. It is evident that classification in the hydraulic pocket does not entirely take place under hindered-settling conditions, because in that case the sand treated by the wheel could not contain any slime. The amount of hydraulic water used is such that the dilution of the overflow does not exceed the required density and therefore the classification cannot be perfect. However, the most objectionable factor, namely, the presence of slime in the jig feed, is to a large degree eliminated by the subsequent action of the paddle-wheel. The moisture in the sand discharged by the wheel can be regulated in two different ways, (1) by raising the level of discharge, and (2) by increasing the distance between the tips of the blades and the discharge.

The discharge level of the sand product can be varied by inserting strips of wood of different heights into the slots marked S. To obtain practical results the sand is discharged at a point 1½ in. above the overflow with 50 to 55% moisture, but with the level of sand discharge raised to 2½ ins. above the overflow, and the discharge edge spaced from the wheel as shown in the drawing, the product contains but 30 to 35% moisture, but under these conditions the capacity decreases out of all proportion. If the machine is overfed, the sand piles up so high at the discharge that part of it remains lying on the paddles, and falls back into the trough at the other side, finally choking the classifier.

A spray is provided to remove the adhering grains

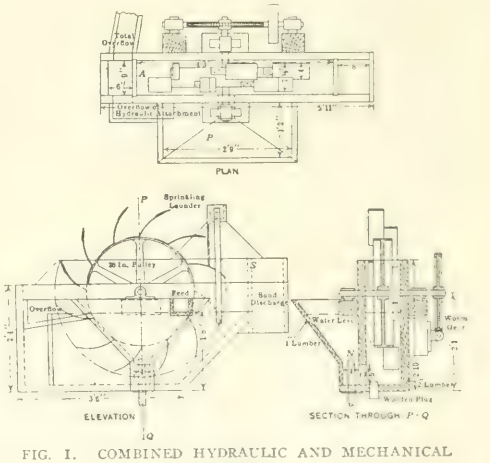


FIG. 1. COMBINED HYDRAULIC AND MECHANICAL CLASSIFIER.

of sand from the blades of the wheel, and after having cleaned the blades, the water falls on the pile of sand lying in front of the wheel and gives it a final wash. The slower the wheel revolves the cleaner will be the sand product, because then every blade brings up slightly more sand than it can deliver, and part of the material falls back into the trough to be shoved up again by the next blade. Therefore the sand is repeatedly turned over before being discharged, which materially assists in removing the slime.

The classifier can easily handle 60 tons of dry pulp with a specific gravity of 3.5 to 3.8 per 24 hours.

The jigging practice has considerably improved with the better adapted feed, and the grade of the concentrate has been raised from 66% metallic tin to an average of 70% and more.

The supply of selenium is obtained almost wholly from reworking the residues of electrolytic copper plants and the flue dust in sulphuric acid chambers.

What the Mining Companies are Doing

Davis-Daly Copper.

The report of the Davis-Daly Copper Co. for the quarter ended March 31 shows as follows:

Ore returns	$42,540
Miscellaneous revenue	2,228
Total	$44,768
Development	36,981
Mining cost	30,586
Equipment	297
General expense	4,408
Total disbursement	$72,272
Deficit	27,504

In the quarter ended Dec. 31, 1915, receipts were $73,092, expenses $69,627, profit $3465. Shipments were 86 cars of ore averaging nearly 7% copper and 7 ozs. of silver per ton.

Secretary C. G. Schirmer says: The greater part of the drifting on the 2500 level was in ore and we now have a vein showing an ore shoot 380 ft. long, and promising to continue for some distance. This is the longest ore shoot ever found in our mine and some portions contain the highest grade ore ever shipped from the Colorado shaft.

In order to carry out economies which seemed very necessary the directors instructed the general manager to order a new hoist. Our antiquated hoist had become very dangerous and inefficient, and it was found that by installing a new hoist, conditions at the mine would be greatly improved. This hoist will handle 3½ tons of rock at a depth of 4000 ft., its capacity to be 1100 tons in 16 hours net. The Nordberg Co. agree to deliver the hoist in 4 months.

The matter of ventilation is quite a serious problem and is having the closest attention of those in charge of the property and a marked improvement in air circulation is hoped for in the near future.

Shipments for the 3 months amounted to 75 cars aggregating 4208 tons, producing 278,389 lbs. of copper and 17,844 ozs. of silver.

Butte & Superior Co.

Earnings of the Butte & Superior Co. for the quarter ended March 31, 1916, compare with previous quarter as follows:

	1916.	Increase.
Miscellaneous income	$ 21,427	$ 5,162
Total net value	4,623,143	750,254
Profits	3,554,940	794,901
Total profits	3,554,940	461,141

The profits are equal to 13.03% a share, against 11.37% the previous quarter.

United States Smelting.

The United States Smelting, Refining & Mining Co. earned for the first 4 months of this year close to $4,000,000, April showing well over $1,200,000. Partially estimating May and June, net profits for the first half year are expected to touch $7,000,000.

The profits for this month and next should be easily the best in the company's history. There is an extra day in May and all metal prices are well above last month's figures. Lead will average nearly a cent a pound higher, copper from 1½ to 2 cts., while silver has been jumping to new high prices almost every day.

The part silver is likely to play in earnings from now on can be appreciated from the fact that the official average for the first quarter of a trifle over 57 cts. compares with a minimum this month of above 71 cts. Unless there is a complete slump in silver, final profits of United States Smelting for 1916 should total in excess of $14,000,000, or a balance after depreciation, interest charges and preferred dividends of $11,000,000. This would mean a balance of over $31 a share for the common.

The company's current Mexican production, which is pretty close to normal, is 50,000 tons of ore a month. It has been figured that if only 20% of this production or 10,000 tons is taken from the new veins, normal silver profits will be swelled by $2,500,000. This is on the basis of 50-ct. silver.

On the basis of 75-ct. silver the same proportion of extraction from the new strike means an increase in silver profits of $3,750,000, of itself the equivalent of $10 per share for the common.

Shattuck-Arizona.

The quarterly report of the Shattuck-Arizona Copper Co. for the period ending March 31, 1916, shows as follows:

Gross value of all ores	$1,239,658
Miscellaneous receipts	768
Interest received	537
Total	$1,240,964
Operating expenses	453,471
General office expenses and taxes paid	6,112
Profit	$ 781,380

The following is a summary of mine and smelter production for the quarter:

	Copper ore.	Lead ore.
Dry tons mined	37,114	2,595
Dry tons shipped	37,381	3,544
Dry tons smelted	37,377	3,601

The total net cost of 6.44 cts. per pound of refined copper does not include the charge for depreciation of equipment of approximately .18 of a cent per pound.

Operating results for the quarter show as follows:

Pounds copper recovered	4,682,691
Ounces gold recovered	1,538
Ounces silver recovered	89,695
Pounds lead recovered	1,481,387
Net operating cost per pound of copper, cts.	6.31
General office expense and taxes paid, cts.	.13
Total net cost per pound of copper, cts.	6.44

The average price received for the quarter's production was 23.1 cts. per pound.

New Idria Quicksilver.

The New Idria Quicksilver Mining Co. states that it has expanded production from an annual basis of 6250 flasks, the output for 1915, up to 800 flasks per month at the present time. This is an increase of 50%. In January and February the production was around 550 flasks in each month, March was up to 700 flasks, and April 800, with every prospect that for the balance of the year the latter figures will be maintained.

It is officially stated that certain changes in the smelting processes have been made by which a larger tonnage of ore and ore of a lower grade can be handled, the combined result of which is a larger output with no increase in costs per unit of output.

Quicksilver is now quoted at $100 to $105 per flask, as against a recent high of $300. The latter price, however, was obtained for a small tonnage only and none of the producers was able to secure for any substantial tonnages much over $200 to $250.

Tonopah-Belmont.

The Tonopah-Belmont Development Co. reports for fiscal year ended Feb. 29, 1916:

	1916.	1915.
Total income	$1,047,767	$1,562,694
Total deductions	46,740	105,996
Net income	$1,001,027	$1,456,698

MINING AND ENGINEERING WORLD

Published every Saturday by
MINING WORLD COMPANY, Monadnock Block, CHICAGO
Phone Harrison 2893

New York: 35 Nassau Street. Phone Cortland 7331.

Entered as Second-Class Mail Matter at the Post Office at Chicago, Illinois

LYMAN A. SISLEY . . . . . President
K. P. HOLMAN . . . . . Vice-President
C. A. TUPPER . . . . . Secy. and Treas.

SUBSCRIPTION PER YEAR
United States and Mexico, $3.00; Canada, $5.00;
By Check, Draft, Post Office or Express Order

ADVERTISING COPY
Must be at Chicago Office by 10 A. M. Monday to insure publication same week

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Fortunate, Indeed, are Holders of Shares in Mines and Works.

Fortunate, indeed, is the individual at any time who owns shares in American mines and works, but unusually fortunate is he who owns shares during this present year of record-breaking dividend payments. The simple statement that stocks in mines are more than profitable holdings does not adequately express present conditions, for it is little short of marvelous the way stockholders are being enriched.

Mining and Engineering World is in position to state, from reports made to it, that dividends have been disbursed so far this year (5 months) greater than were disbursed during an entire year but a few years ago, and at that time mining was acknowledged as paying larger dividends than any other industry.

From these reports it is learned that dividends were paid by American mines and works during the first 5 months of 1916 amounting to $66,407,000, with 123 companies participating. This compares with $26,570,951 by 90 companies in 1915; by $35,644,726 by 104 companies in 1914, and by $51,692,201 by 141 companies in the record year 1913. That American mines and works are not so-called fair weather dividend payers is evidenced by the fact that our records show total disbursements of these 123 companies since incorporation amounting to $1,129,575,986, a return exceeding outstanding capital by $290,717,725, a truly remarkable performance, when the youth of some of the companies is considered.

In compiling these disbursements it was found of great interest to readers of Mining and Engineering World to classify the producers under various heads and a selection was made as found to best make this separation: Copper producers; gold, silver, lead and zinc producers; metallurgical companies and holding companies.

Under this classification we find that 30 copper properties have made disbursements so far this year totaling $32,009,754. This compares with $9,284,010 by 20 companies in 1915, by $17,697,253 by 24 companies in 1914, and by $20,297,498 by 31 companies in 1913. To date the 30 copper companies paying dividends in 1916 have divided among shareholders no less than $602,955,685 on an issued share capital of $817,030,772.

Eighty-seven companies, classed as gold-silver-lead-zinc producers, participated in the 1916 disbursements to the extent of $26,364,644. This compares with $12,005,191 in 1915 by 64 companies; by $12,607,251 in 1914 by 73 companies, and by $16,650,251 in 1914 by 97 companies.

Of the 87 companies mentioned above, 64 operate properties in the United States and they disbursed $22,238,225 during the year and $246,731,215 since incorporation.

Twenty-one of the above are Canadian companies with payments to their credit for the year totaling

$3,733,499 and to date $66,071,828. But two Mexican properties in this class report as having made disbursements in 1916.

The metallurgical companies participated in the year's disbursements to the extent of $9,532,602, six companies participating. This compares with $4,271,750 by six companies in 1916; with $5,250,222 by five companies in 1914, and with $5,079,382 by five companies in 1913. To date the companies paying dividends in 1916 have disbursements to their credit of $209,768,171.

In mentioning securities-holding corporations, we feel there is an explanation necessary owing to the fact that the earnings of these companies are looked upon as coming from holdings in other companies. This is true to some extent, but there is nevertheless a large share of these earnings derived from the operation of their own mines, which should be credited to operating companies. But as this information is not obtainable, earnings are credited to holding companies. So far this year six of these companies have disbursed $22,441,721, more than half of this coming from a settling up of the affairs of the Guggenheim Exploration Co. To date these six companies have divided $137,192,735 among fortunate shareholders.

In the following table is shown a list of companies paying dividends in May, the date, amount per share and amount paid. For dividends paid by these and other companies prior to May see dividend tables published elsewhere in Mining and Engineering World.

	May.	Per share.	Amount paid.
Alaska Treadwell, Alaska	29	$ .50	$ 100,000
Anaconda, Mont.	20	1.50	3,496,875
Big Four Expl., Utah	15	.05	20,000
Bunker Hill Con., Calif.	4	.02½	5,000
Bunker Hill & Sullivan, Idaho	4	.40	163,500
Caledonia, Idaho	5	.03	78,150
Center Creek, Mo.	1	.25	25,000
Champion, Mich.	27	6.40	640,000
Chief Con., Utah	7	.05	43,852
Elkton Con., Utah	19	.02	50,000
Federal Smelting, pfd., Idaho	22	1.00	120,000
Golden Cycle, Colo.	10	.02	30,000
Granby, B. C.	1	1.50	224,578
Greene-Cananea, Mex.	29	2.00	972,418
Hecla, Idaho	20	.10	100,000
Hercules, Idaho	15	.30	300,000
Hollinger, Ont.	20	.20	120,000
Homestake, S. D.	25	.65	163,254
Inspiration, Ariz.	1	1.25	1,149,859
International Nickel, pfd.	1	1.50	133,689
Joplin Ore & Spelter, Mo.	1	.05½	22,004
Lake View, Utah	10	.02¼	11,254
Lucky Tiger, Mex.	20	.06	12,900
May Day, Utah	26	.02	16,800
Miami Ariz.	15	1.50	1,120,671
National Zinc & Lead, Mo.	31	.05	25,000
New Jersey Zinc	10	9.00	3,150,000
Oroville Union, Calif.	12	.10	5,215
Peacock, Wis.	1 and 15	.20	10,000
St. Mary's Min. Land, Mich.	29	2.00	320,000
Seneca-Superior, Ont.	15	.20	95,768
South Eureka, Calif.	15	.07	20,990
Standard, B. C.	10	.02½	50,000
Success, Idaho	23	.03	45,000
Tamarack-Custer Con., Idaho	1	.02	40,000
United Verde, Ariz.	3	.75	225,000
Wasp No. 2, S. D.	15	.02½	12,500
Wilbert, Utah	1	.01	10,000
Yellow Aster, Calif.	6	.03	3,000
Yellow Pine, Nev.	10	.15	150,000

What is to Come After the War is Over?

Col. George Pope, president of the American Association of Manufacturers, is quoted as saying in his address to the meeting of the association:

"After the European war is over the United States will face greater industrial competition than ever before in its history."

Col. Pope holds that when peace comes the countries now at war will wage a relentless fight against America in an effort to regain their lost industrial power.

It will be found that opinions are changing as to conditions after the war.

Domestic conditions are not as they were 6 months ago, not even as they were 3 months ago. Every week shows a substantial increase in the value of the assets of industrial corporations which have been favorably affected by the war.

Peace will not take from these companies what they have already earned and in part used in settlement of their debts. The frothy condition of the stock market may be over, but the actual cash is now coming into the treasuries of the companies concerned.

For the 9 months ended March 31 imports of merchandise into this country totaled $1,504,614,718, and exports $2,997,172,372. The net balance of trade in favor of this country in 9 months was $1,492,557,654. Such figures tell what is taking place in substantially building up the industries of the United States. And when to this total there is added an excess of exports of about $1,700,000,000 in the previous year, the figures become the more impressive.

When times are "flush," as at present, practical mining men with ready capital for investment keep close watch of the annual assessment work, for it is in these periods that some of the best paying mines are really discovered. This is true of all the mining districts of the west. It is unfortunate that the sturdy and never-tired prospector seldom realizes a fortune from his work, but he never starves and frequently makes a fairly good stake to enable him to keep his pick and hammer and shovel busy. The watchdog of mining prosperity comes along to develop what his prospect and assessment work have proven to be possible quantitative mines. This is what the real mining investors do. They are not exchange and curbstone speculators. They put their money in rock and go down to the depths of exploration. The prospector and the operator are twins, but it requires good times to make mining boom, notwithstanding it is mining that makes the great wealth producing possibilities of the country certain. The annual assessment work is the barometer of big mining districts.

Good health is one of the first requisites for the efficiency of labor, for more and better work can be done by strong, well men than by those who are sickly. The maintenance of working conditions such as will not menace the health of the worker is therefore to be desired in all occupations. This is not a matter of sentiment only, but one of dollars and cents. Money invested in fresh air, good light, pure water and generally clean conditions will return good interest in the shape of increased labor efficiency.

The Question: When to Stoke?

By Frank G. Bolles.

If the question "When to stoke?" were put to the most ordinary fireman of a boiler plant he would smile and think it a joke. Surely who would be so ignorant as not to know "when to stoke"? When the fire in the grate burns low—"stoke." When the house grows cold—"stoke." When the steam drops on the boiler gauge—"stoke." When your stomach howls for food —"stoke." When the gasoline in your motor runs low—"stoke." When saleable stock runs low you order more stock—"stoke," and so on ad infinitum.

Webster defines the word "stoke" as meaning "to supply with fuel." But, notwithstanding the well-recognized application to most of our everyday needs there is one place where the need of stoking is vital to business that is not fully appreciated. I refer to a scarcity of orders in the factory.

Orders are to a factory what fuel is to a fire. Both are necessary to prolong life. If we lack fuel the problem under ordinary conditions is an easy one. There are times, however, when it is not so easy. When there is a strike or snow blockade interfering with delivery the problem becomes a real one. It would not be considered good business under such conditions to order the telephone disconnected, refuse to use the telegraph, or discharge the purchasing agent. Nor would it be done. All of these sources of help to get "fuel" would be working overtime. Yes, and many times they are supplemented, for it is not unusual to add to the energy of the regular force by sending out a good man to locate the fuel, and stand by until he actually sees it move toward the plant, and follow it doggedly to its destination.

When "power" is needed to manufacture goods the energy is always forthcoming, and usually without regard to expense. This is when we want fuel to stoke the boilers. But when power is needed to get orders to keep the factory busy someone shuts the throttle.

As stated above, orders are to a factory what fuel is to a fire. This is a self-evident truth. Yet, when orders commence to run low, what happens? Do we put forth unusual energy to get more orders and trim factory expense? Are special envoys sent out to improve the situation? Do we increase our advertising space so as to reach every possible buyer of our goods? In other words, do we "stoke"? In rare cases, under wise supervision, we do, but in the large majority of cases we do not.

The usual program, when orders are scarce, is to immediately cut off the very fountain-head of new business, namely, advertising. Then comes the trimming of the sales department. Men are dismissed and disorganization follows. Those who remain are disheartened and all enthusiasm is killed. This program destroys the very fuel so badly needed to keep up the factory pressure. Yet men who are charged with the management of huge enterprises do these things that are really contrary to all reason. They want business, but, unthinkingly, abandon the very means of getting it.

From their viewpoint they must economize because orders are not plentiful. And the first view in their economical minds is to lop off the advertising appropriation. Is it real economy to destroy that which will produce? It may be true that there are not many orders to secure. This should mean greater effort to secure those that are to be placed.

If there is a period when an advertising campaign should be curtailed it is during exceedingly good times. When business is slack and more orders are needed you should be active in advertising in the inverse ratio. In fact, however, the only time to advertise is "all the time"—in other words, insure your business.

Rather Young to Begin.

What constitutes the smallest profitable mining operations on record have just been authentically reported from Everton, a small mining camp northeast of Joplin, Mo. The two sons of Harry Killingsworth, respectively aged 7 to 10 years old, persuaded their father, who owns a lease in that camp, to let them have a play lease of 10 ft. sq. out of the corner of his lease, and let them play working it. This he did and made for them a toy windlass, whose capacity was limited to a water bucketful of dirt at a time. This was duly set up on the lease and the boys started a little shaft about 3½ ft. in diameter. They carried on their operations in every respect just like their father did, only a short distance away, and at a depth of about 2½ ft., the boys actually struck "pay dirt" in a gray silicate of zinc ore. The boys hoisted this soft ore by the bucketful and took out the first week 5 wash tubs full of this pay dirt. Their father helped them get it down to the creek and showed them how to wash it, where he had his own wash place, and kept the mineral separate and sold it for them at the end of the week. Their check amounted to $21.40 and Everton celebrated the making of two new mine operators whose first venture was successful, and at the earliest age ever known.

Foreign Visible Copper Supply.

Copper visible supply in England, France and afloat thereto decreased 600 tons from May 1 to May 15, being 15,356 tons on latter date. Recent figures of visible supply compare as follows:

	1916.	1915.	1914.	1913.
Jan. 1	20,961	26,369	[illegible]	10,380
Feb. 1	17,716	29,092	[illegible]	22,858
Mar. 1	16,771	29,352	[illegible]	26,176
Apr. 1	12,291	[illegible]	[illegible]	32,791
May 1	16,046	26,314	20,360	30,467
June 1	.....	28,917	24,352	29,634
July 1	.....	[illegible]	25,498	28,172
Aug. 1	.....	35,063	26,739	28,374
[illegible]		30,961	27,923	26,536
[illegible]		28,922	29,671	22,784
Nov. 1		24,855	31,113	21,789
Dec. 1		26,895	30,626	21,114

PERSONAL.

T. W. Gruetter, operating dredging ground near Medford, Oregon, is in San Francisco, Cal., on business.

C. A. O'Connell on June 1, took over the general managership of the Tough Oakes mine at Kirkland Lake, Ont.

M. L. Uglow, Minneapolis, Minn., has accepted a position with the Cerro de Pasco Mining Co., Cerro de Pasco, Peru.

A. S. Ross, president of the Wilbert Mining Co., Salt Lake City, Utah, has left on business for Chicago and New York.

The Tri-Bullion Smelting & Development Co., New York, has appointed G. E. Farish as consulting engineer for their company.

William B. Morrison, Salt Lake City, Utah, has accepted the position of general master mechanic for the Kennecott Copper Co., Alaska.

M. H. McLean, general manager of the Detroit Copper Co., Morenci, Ariz., is on business in New York and during his absence A. V. Dye will be acting general manager.

J. A. Kusche, a member of the faculty at Harvard University, Boston, Mass., is now in the vicinity of Skagway, Alaska, making a detailed geological study of that area.

William A. Franklin, mining engineer, Chicago, Ill., is at present in Cottonwood, Utah, superintending operations on development work at the property of the Wasatch-Utah Co.

R. H. McKee has accepted the position as head of the research department of the Tennessee Copper Co., at Ridgefield, N. J. He was formerly professor of chemistry at the University of Maine.

A. F. Kuehn, consulting engineer, London, has completed an examination of the Bawdwin lead-zinc mines in Burma. He will return via United States and make short stops at the larger cities before leaving for London.

William F. Jahn has returned to Riebeling, Mont., from San Juancito, Honduras, where for the past 3 years he has been mill superintendent for the New York & Honduras Rosario Co. F. C. Devereux has filled the vacancy.

W. K. Mallette is in charge of smelter construction work at the new plant of the Bunker Hill & Sullivan Co.'s new smelter at Kellog, Ida. At present he is in San Francisco, Cal., relative to this construction. He was formerly with the Anaconda Copper Co., on smelter construction work.

OBITUARY.

Just as we go to press we learn with great regret of the death of W. P. Harper, who has for many years past been general manager of purchases and stores for the Allis-Chalmers Mfg. Co., Milwaukee. Mr. Harper's influence extended over a wide field, and throughout the metallurgical industries his loss will be genuinely mourned by thousands of men who have been helped in their careers by his kindly assistance and advice. Among the purchasing officials of the country he was probably the best known and the best liked, and his influence was always exerted for "quality and service."

Edward Davis, a well known operator and prospector in Alaska, passed away on May 5, 1916, near Atlin, Alaska. The deceased was a civil war veteran born in the state of Delaware. In about 1870 he came west and first located in Montana and a short time later went to Nevada, where he, with other prospecting partners, located what was known later as the great Comstock lode of that state. After contending for these claims in legal action and losing he went to South Africa in about 1893 and with the rush to the Yukon, came to Alaska in 1898. Since that time he has operated in Alaska in several different places until the time of his death.

SCHOOLS AND SOCIETIES.

Colorado School of Mines.—In accordance with the permission given their new president last fall, to make changes in the faculty of the school at the end of his first year, the following changes are announced: George J. Young, now professor of mining engineering at the University of Minnesota, to take the professorship of metallurgy; Claude C. Van Nuys, professor of physics, South Dakota School of Mines, the professorship of physics; Carrol C. Dolman, principal of Monte Vista high school, Colorado, assistant professor of English and foreign languages; and Fred G. Carter, University of Wisconsin, athletic director. These appointments will take effect Sept. 1, 1916.

COMMUNICATIONS.

[This department is for the exchange of ideas bearing on all branches of the mining and metallurgical industries. Mining and Engineering World will not be responsible for the statements made nor opinions expressed by correspondents.—Ed.]

No Boom or Mis-statements Wanted.

Editor—A statement published in a western publication under date of May 22, under a Midas, Nev., headline, regarding the production of the Elko Prince mine and other matters connected therewith, do not even approximate the truth, and appears to me as part of a "bull" campaign by some people who either own a small amount of the stock or have an option on a certain amount of stock to make a bull market.

Mr. Savage, the president of the Elko Prince Mining Co., has had under consideration the listing of the stock on the curb for the purpose of making a market for minority stockholders. I am assured, however, by him that no information will be given out regarding the property, except in the way of circular letters or reports to stockholders.

The property is being operated by the Elko Prince Leasing Co., of which I am president, which company erected the mill on the property, and will operate the whole property for a period, depending upon the time it takes to produce a net profit to repay development and equipment expenses upon the property.

Mr. Savage and I both feel very strongly the importance of avoiding speculation based upon incorrect reports being circulated or misleading statements of any sort. We will be very glad to advise you whether any information coming to you in the way of news is correct or not, and I will personally appreciate any assistance you can give us.

Denver, Colo. JOHN V. N. DORR.

NEW PUBLICATIONS.

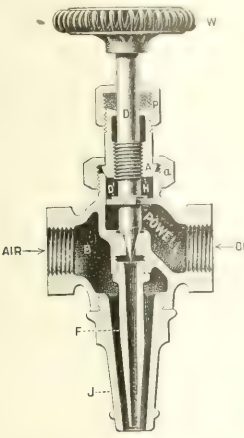
Oil Engines. Burnoil Engine Co., South Bend, Ind. Booklet; pp. 12; illustrated.

With the opening of many oil fields in close proximity with our mining fields of the western states, the Diesel and other types of engines using any kind of crude oil or derivative therefrom, have become very well adapted to these fields. It is claimed by this company and has been their endeavor to design an engine capable of using all varieties of crude oil but not containing complicated mechanism and the many intricate parts therein necessitated. In this way it is possible to make the construction of an oil-engine with small horsepower similar to the Diesel, developing the larger horsepowers. No electric ignition is used. Besides drawings, illustrations and a description of the engine's construction and operation, a table giving details for the 1, 2 and 4-cylinder engines, which are rated at from 10 to 40-hp., and another comparing the cost of power for the gasoline, steam and oil engines and electric power are given in this booklet.

Progress Made in the Manufacturing Industries

The Powell Oil Burner Valve.

The engineering department of the William Powell Co., in designing this valve, made special tests for proportioning the oil tubes and air nozzle in the development of its oil burner valve, so as to produce the maximum amount of heat with a minimum amount of oil and air. The construction enables it to withstand the usual rough usage to which valves of this kind are subjected. The free and unobstructed passage of the oil will not clog or interfere with the proper flow, and can be used in connection with compressed air, blowers, fan blast or steam. It has proven and is used by many manufacturers and consumers of oil burning furnaces in foundries,



POWELL OIL BURNER VALVE

annealing ovens, forging plants, smelting and metal refining companies, etc., with satisfactory results.

Some of the various features claimed by the manufacturers are: D—Stem machined with needle point and fine thread, permitting a close regulation of oil. A—Bonnet with cone or beveled face connection similar to ground joint union. a—Hexagonal union swivel nut tightens trimmings to the body, red lead or cement is unnecessary to make it tight. B—Body shell shows the exact and uniform distribution of metal, also diaphram thickness for a good long-tapered bearing. W—Brass wire-bound easy grip non-heating hand wheel. P—Packing nut, deep and spacious for packing material. F—Oil tube, long taper point adapted for close control and saving of oil. J—Air nozzle, heavy and strong for durability and general conditions as a spray or atomizing transmitter.

All mechanical parts made to standard gauge and interchangeable.

TRADE PUBLICATIONS.

Inter-Phones for Mines and Plants. Western Electric Co., New York. Catalog; pp. 60; illustrated.

The line of inter-phones, the company's trade name for the intercommunicating telephone it manufactures, is shown at length. The various systems available for intercommunication are fully explained, with diagrams showing the service given by each. This is accompanied by complete information as to the amount of wire and cable required as well as the operating battery requirements. Several new systems have been developed and are here listed. They include, among others, a new annunciator system, arranged for from 10 to 70 stations or more, and a new apartment house system, to provide for inexpensive and flexible installations.

Mine Ventilation Fans. Jeffrey Mfg. Co., Columbus, Ohio. Bulletin 110; pp. 8; illustrated.

A description and illustrations are given of the stepped, multi-bladed type. Wheels for both double and single inlets are included and the results of a test on the single inlet type are given in tabulated form. A table showing the volume, water gauge, horsepower and revolutions per minute for both single and double inlet types is given.

Rules for Conducting Performance Tests of Power Plant Apparatus. American Soc. of Mech. Eng., New York. Report of Power Test Committee, 1915.

Complete descriptions and detailed information regarding the apparatus to be used for testing the following equipment are given: Boiler; reciprocating steam engines; steam turbines; pumping machinery; compressors, blowers and fans; complete steam power plants; locomotives; gas producers; gas and oil engines; waterwheels, etc.

Recorders and Gauges for the Power Plant. The Foxboro Co., Foxboro, Mass. Booklet; pp. 28; illustrated.

One page, including an illustration and short description, is given to separate instruments. The description is general and gives a few of the details. Among some of the instruments described are recording and pressure gauges, differential recorders, electric and mechanical time recorders, liquid level recorders, orifice meters, recording thermometers and hygrometers, electric pyrometers, etc.

Wagon and Truck Loaders. Link-Belt Co., Chicago. Catalog; pp. 64; illustrated.

Many different types of loaders are described and illustrated and in bringing up each different type a talk is given on the particular adaptability of each. They are of use in the loading of any solid loose materials into wagons, cars, etc., such as coal, sand, stone, ores, etc. Systems for removing coal, ores and the like from cars to the bin are given, and in the final pages unloaders for cars are taken up.

Graphite for Cylinder Lubrication. Joseph Dixon Crucible Co., Jersey City, N. J. Booklet; pp. 16; illustrated.

The booklet is titled "Graphite for Cylinder Lubrication." The principal purpose of this booklet is to bring out types of engines in which flake-graphite is being used as a lubricant. In each case a short discussion is given which brings out the primary reason as to why flake-graphite should be used and exactly what kind should be used. Correct methods of introducing it are spoken of. Steam and combustion engines and compressors are all taken up.

INDUSTRIAL AND TRADE NOTES.

The Van Dorn & Dutton Co., gear manufacturers of Cleveland, O., has removed its Denver, Colo., office from the Ideal building to 633 Tremont street. C. H. Davidson is in charge.

The Kalbperry Corporation has opened an office in the Metropolis building, 31 Union Square West, New York, for the purpose of conducting a chemical engineering business, including the erection and equipment of plants. The chief engineer, H. E. Hollister, will be glad to receive for his reference file copies of any catalog pertaining to the subjects mentioned.

Late News From the World's Mining Camps

Editorial and Special Correspondence.

ALASKA.

Valdez.

From April 1 to 23 the Alaska Gold Mines Co. milled 126,000 tons assaying 79.3 cts. General Manager Thane says: "Condition of stopes east of the shaft shows great improvement and I shall be able to resume delivery of ore from No. 2 east of No. 5 level and from new stopes opened east on No. 6 and No. 7 levels. Grade of ore should improve during the entire month of May and show marked improvement during the entire month of June. Tonnage maintained, I expect will be about 6000 tons per day until about the middle of June, when new stopes east of the shaft should be in good condition to deliver their proper percentage of ore, so that tonnage can be thereafter increased." In the first 10 days of May the company treated 6000 tons of ore per day, running $1.60 per ton. The average assays for the month of March and February were $1.02 and $1.03 a ton. In January ore averaged only 94 cts., but this was raised to $1.02 and $1.03 in February and March. During the last week of April workings in the schist formation east of the shaft began to produce and the average of the combined ore, amounting to 40,000 tons, was $1.40 on this account.

It is rumored that M. F. Hendrickson, now in New York, has raised money with which to reopen the Three-in-One mine. To sustain this it is known that Superintendent F. J. Devinney has put 3 men to work getting the mine into condition again.

In the Stewart river district, pay dirt has been located on Nelson creek and a rush to the location has been in progress for some weeks. The creek is said to be 20 miles long, and 45 to 50 claims have been staked. More are still on their way there to plant their posts. The creek on discovery was 6 ft. to bedrock, and a summer proposition. The discoverers got 20 cts. in gold to 16 pans. The best pan went 1.6 cts. It is rumored that the country is well wooded and offers plenty of construction timber.

ARIZONA.

Ray.

Excitement is growing over the progress in this district. The Ray Con. Co. is maintaining a steady production of 9500 tons. The ore is shipped in 60-ton steel cars to the company's concentrator at Hayden, which reduces 16 or 18 to 1 and shoots the product over to the smelter, 100 yards to the east. The ore averages 1.75% copper and approximately 70% is saved. The Pinal Development Co. is developing the Renfro group at Troy. A 100-ton concentrator is to be placed on the Sullivan mine, which has a big known deposit of vanadium ore. Arrangements are being made to sink a 500-ft. shaft at the Ray Lode. Four churn drills are being operated 24 hours on the Ray Hercules, and a shaft is being put down. Just what has been discovered is being held secret by the management, but it is generally believed that the determinations have been satisfactory. There is a report that rich ore was encountered in the shaft at a depth of 120 ft. Until the burning of the sampling mill forced a curtailment of operations at the Hayden smelter the Ray Hercules was shipping some ore to that plant. For some time Ray Hercules has owned an excellent concentrator site at Kelvin, 6 miles below Ray on the Phœnix and Eastern railroad. There is some reason for believing the road will soon be built and that the company will complete the magnificent concrete hotel it started to build in the northeast part of Ray. The hotel is about half finished.

Prescott.

Yavapai county's silver mining industry—quiescent and more or less moribund since the repeal of the silver purchasing act in the early nineties—has been quickened by the recent advance in the price of that metal, and is now assuming active proportions. There has been no period since the demonetization of silver when the financial wellbeing of that branch of the county's mining industry was so thoroughly assured as now.

The Randolph-Gemmill Development Co.'s mill, the Saratoga Mining Co.'s mill and the mills of the Tiger Silver and Tiger Gold Mining companies, are operating day and night on silver and gold ores of the Bradshaw mountains. Two additional mills are to be erected as well as a custom plant in the vicinity of the camp of Crown King for the treatment of custom ores of that locality in general.

The Crown King, Wildflower and Tiger mines, owned by the Yavapai Con. Gold-Silver-Copper Co., have been taken over by the Bradshaw Reduction Co.—holding company for the Randolph-Gemmill Development Co. The first mentioned corporation has also acquired control of the War Eagle-Gladiator group under a lease and bond. It is the purpose to aggressively develop all four of the properties and to treat the ores in the Randolph-Gemmill mill. The latter is to be enlarged to meet the additional ore reduction demand. The ores carry commercially valuable copper, lead and zinc, in addition to pay values in gold and silver. These determinations have been satisfactorily demonstrated at the Randolph-Gemmill plant.

A copper property in Yavapai county that is being financed with pronounced success is that owned by the Loma Prieta Mines Co. in the Copper Basin district. The stock of this company, placed originally at 25 cts. per share, is now selling at $1. Reorganization of the company was recently perfected and the treasury holdings increased to 600,000 shares. John Livezey, formerly of Leadville, is general manager of the Loma Prieta. The company's property adjoins the Commercial mine, which is outputting an average of 85 tons of copper ore daily, and carries the main sulphide ore channel of the Copper Basin district. The Loma Prieta shaft is being deepened to the 200-ft. point, and is in high-grade chalcopyrite ore from the 85-ft. point to its present depth of 125 ft.

Plans are completed for listing the shares of the Tuscumbia Mining & Milling Co. of Arizona on the San Francisco stock exchange. The company was incorporated in March, 1916, for 1,000,000 $1 par shares. The corporation is headed by local mining and business men. The property has a production record of $1,000,000 in high-grade silver ore that was mined from near-surface workings. The ore is identical in appearance and value to the rich silver ores of the Tonopah district, and, like those of Tonopah, occurs in the lode porphyry. Development work is in charge of James H. Sullivan.

CALIFORNIA.

Grass Valley.

An electric power line is under construction to the Allison Ranch mine and arrangements have been made to install pumping equipment. Orders will also be placed shortly for a compressor and drills. Charles A. Brockington is superintendent.

The Cassidy Mines Co. has been incorporated, with a capital stock of $200,000, to reopen and operate the Cassidy

property in this district. Sinking will commence early in June in hopes of intersecting the Cassidy and Linden veins. The Cassidy lies between the Empire and Pennsylvania mines and produced rich ore in the upper workings.

The Pittsburg mine, in the Gold Flat district, has been acquired by Bert Schlessinger and associates of San Francisco, and developments are being pressed. A crosscut is being driven toward the vein and is expected to enter pay ore within a few weeks. The Pittsburg is an old property and has been worked intermittently for 50 years. Herbert Oates of Nevada City is superintendent.

Redding.

The Shasta National Copper Co. has been formed by local capitalists to develop 1000 acres of copper-bearing land adjoining the holdings of the Mammoth Copper Co. The company is incorporated with 5,000,000 shares, par value $1. Directors are C. F. Brouillard, William H. McEwen, S. S. Norton, M. F. Fries of Redding and A. J. Shields of Anderson. The company also intends to operate mining properties in other sections of the county.

J. W. Killinger has taken under bond from Frank Panter the Garfield gold mine in the Old Diggings district. The old 150-ft. tunnel will be extended and a new crosscut driven 600 ft. The Garfield produced rich ore 20 years ago, but the loss of the ore shoot caused its closing after a few shipments of rich quartz had been made. Developments will be commenced immediately.

Hayfork.

Rich ore has been encountered in the Black Bess mine, owned by Benjamin Murphy and Alonzo Layman; 10 tons of ore yielded $800. The shoot is reported to be showing strength with development.

Tungsten City.

This new camp, near Bishop, is the center of a live mining section. Several tungsten companies are operating and preparing to start production of concentrates in a few weeks. Water has been brought to the camp from nearby springs and a business center established. High-grade zinc ore was found last week about 3 miles from here and several prospectors are exploring the deposits. Eleven claims have been located and more are being staked out.

Lewiston.

Claims along the Trinity river from Lewiston to Poker Bar, aggregating 1500 acres, have been taken under bond by a syndicate of Los Angeles and San Francisco capitalists. The purchase price averages $200 per acre, said to be the highest rate commanded by placer territory north of Oroville. It is intended to operate three gold dredges on the territory, and orders have been already placed for No. 1 boat. The company has been prospecting the ground for several months with drills, and has proven the deposit to range from 15 to 30 ft. in depth. The syndicate is represented by W. B. Winston of San Francisco and C. A. March of Los Angeles.

Atolia.

Local tungsten producers are curtailing their output, following the appearance of scores of new producers in California, Nevada and other states. The Atolia Mining Co. has closed its Parr mine. Other companies state buyers are showing little interest in offers and that too much ore is being produced.

Mountain Ranch.

A ledge of rich ore has been encountered in the property of the Calaveras Development Co. The general average assays approximate $100. Drifting is proceeding to determine the width and extent of the vein. The company is also working 200 acres of placer ground.

Columbia.

The Springfield Tunnel & Development Co. has discovered a deposit of rich gravel in the Ranch claim, located several hundred feet from the recent bonanza strike in the Buchannan channel. The new discovery was made while running a drift from an old shaft to connect with workings from the main tunnel, and shows a large deposit containing considerable coarse gold. The deposit encountered in the Buchannan channel is being opened by raises and drifts. It is 4 ft. thick at the rim and is deepening as the center is neared. As the tunnel advances shafts will be sunk to work rich channels and pockets as they are freed of water. The tunnel is now in about 2850 ft. Joseph Cademartori has been appointed general superintendent, recently made vacant by the death of A. L. Horner.

Folsom.

Deposits of chrome in this section are being vigorously worked and a number of important deals have been announced. The Manganese Co. of San Francisco has purchased a large deposit on the Steele ranch, near Pilot Hill, from G. W. Neilsen, J. J. Smith and P. F. Donnelly of Folsom. Extensive developments will start at once. D. E. Wiley of Folsom and M. Armstrong and J. J. Beyne of El Dorado have sold their chrome holdings to San Francisco people. S. W. Hill and associates are ready to start shipments of chrome to eastern mills.

Magalia.

The Willard placer mine has been acquired by W. E. Young and S. D. Mesmith of San Diego and operations started. Driving of a tunnel is proceeding to open a quartz ledge recently found on the hillside, and construction of a boarding and bunkhouse is under way. The mine comprises 5 claims and produced fabulously in early days. The largest of numerous nuggets found was extracted in 1856. It weighed 54 lbs. and brought $10,476.

Last Chance.

With abundant water available mining is quite active here; 20 men are working the Home Ticket, with D. M. Day in charge. The long-sought channel has been encountered in the Glen property. Ten men are working under the management of F. A. Moss. The working force at the Pacific has been increased to 25 men and production is proceeding along greatly broadened lines. Several other properties are active, and the outlook is favorable for a prosperous year.

COLORADO.

Telluride.

A good strike has been made at the Imes mine and confirmed by its principal bondholder, E. E. Wheeler, Ouray. He has had this mine and the Fourth of July mine under lease and bond for some time. Mr. Pomeroy of Sawpit, who is in charge of operations, encountered the vein while drifting. The vein averages 2 ft. wide and assay results show about $6 in gold, 6.7 ozs. silver; 10% lead and 21% zinc.

Under Manager Mullen of the Standard Chemical Co., at the Ford camp, diamond drilling is proceeding. The holdings are of carnotite ore and when this is again in demand it is the intention to have the veins well drilled so that a large tonnage can be produced on short notice and kept up.

The Favorite Mines & Reduction Co., with a capital of $25,000, 250,000 shares at 10 cts., paid up and non-assessable, has recently filed articles of incorporation. The incorporators are P. L. Foster, W. D. Thornton and D. A. Herron, who are also the directors. The office will be here. Herron will act as manager. This company has taken over the Favorite mine at Ophir, and have 10 men at present working the property.

Idaho Springs.

A lease has been granted by President Wimbush to Charles Orpin and associates of Denver on the Uncle Sam vein workings through the Big Five tunnel. It runs for 2 years and the lessee is now arranging for the immediate starting of operations. His plan is to put men to work in both headings of the east-west drift. The Uncle Sam lies between the Bellman and Lake properties, both of which have produced heavily through the Big Five tunnel. Lake last year produced about $250,000 under lease.

One lease on this mine recently was sold for $30,000. They have drifted on Uncle Sam about 200 ft., proving a practically continuous streak of ore for the entire distance. Assays show $156 in gold, silver and copper. Small trial shipments have been made. It is thought that they will open into a good shoot of ore similar to the occurrences on the Lake and Bellman.

The American Metals Producing Co., E. S. Moulton, president, and G. W. Adams, secretary, has started the Black Hawk No. 1 plant. It is handling zinc-lead concentrates and

ore. A large tonnage is being secured over the country in Gilpin, Clear Creek and Summit counties. In a few weeks the available supply should be sufficient to increase the milling facilities of the plant to double its present capacity. While confining their purchases to lead-zinc at present, the operators of the plant intend to handle copper-iron sulphides as soon as the necessary extensions can be made. Ores containing low values in gold and silver are also desirable.

On approaching the Joe Reynolds and American veins the Golden Glory Co. has let a contract for 100 ft. of tunneling. It is thought before this 100 ft. is finished the tunnel will have pierced the veins from which the Two American Sisters produced a heavy tonnage of rich ore. The tunnel is being driven through the Saxon mountain and is now in about 1800 ft. An important discovery is anticipated shortly, as the tunnel is exploring a region of proven richness.

Cripple Creek.

New ground of value has been opened on the 19th level of the Portland Gold Mining Co.'s property. The No. 1 vein, as opened at a point 6 ft. from the station, carries 6 ft. of ore, a greater width than has been shown in any level above. The values are higher and the entire vein will average $50 to $125 a ton. The ore is classed as smelting grade. The discovery is considered most important, as ore has been disclosed in such quantity at a depth of nearly 2000 ft. The ore mined in the 18th level was rich, and the developments to date would indicate that the 18th level is probably the most productive level of the mine. The company has still 200 ft. of virgin ground between the 19th level and the Cripple Creek Deep Drainage tunnel level. The discovery proves the continuity of ore shoots to great depths on Battle mountain. This fact has also been proven by the deep workings of the Vindicator Con.

IDAHO.

Wallace.

Development of the Ray-Jefferson consolidated holdings in the Nine-Mile district is exposing larger and better ore bodies than anticipated by the management, according to recent reports. No. 1 tunnel has disclosed an ore shoot at a depth of 380 ft. which is known to extend to the surface. This tunnel is connected by a winze with No. 2, on which the ore shoot has been proved for 400 ft. No. 2 tunnel is 432 ft. below No. 1, which gives a depth on the ore shoot of 810 ft. From No. 2 a crosscut has been run south which intersects two parallel veins showing large ore shoots, one of which has been drifted upon 300 ft. and the other 100. The Carlisle vein has been explored both east and west from the crosscut for 400 ft., showing a continuous shoot of lead and zinc ore from 8 to 10 ft. wide, all of good milling grade, with frequent bunches of high grade. The Carlisle claim was bought less than a year ago and has proved a big addition to the mineral resources of the Ray-Jefferson. Plans are rapidly being carried out to have the mine properly equipped to deliver ore as soon as the mill now under construction is completed. From No. 2 tunnel of the upper workings a gravity tramway will be built to connect with a large ore bin near the boarding house. The bin is now being built and the tram will soon be in course of construction. The tramway will be 1400 ft. long. A raise will be made from the Carlisle tunnel to the surface, a distance on the vein of 250 ft. This raise will be transformed into a mammoth underground ore bin, to which ore from the first bin will be trammed about 600 ft. This ore will be accessible through the Carlisle tunnel, which is practically on a level with the ore bins at the mill. The distance will be 2100 ft. and the ore will probably be handled by electric motors.

The Hecla Mining Co. May 20 paid its regular monthly dividend of 10 cts. a share, or $100,000, the sixth consecutive disbursement of equal amount. This makes the payments for the current year $500,000 and increases the grand total to $4,255,000 on an issued capitalization of 1,000,000 shares at 25 cts. each. In 1915 the Hecla produced 25,000,000 lbs. of lead and 700,000 ozs. of silver, marketed at an average price of $4.866 for the lead and 50.4 cts. for the silver. If production is continued at the same rate during 1916 the annual profit will be approximately $1,400,000, as against $561,752 for the previous year, provided metal prices remain at or near prevailing levels.

Minneapolis and St. Paul people acquired control of the Northern Light Mining & Milling Co. at a recent meeting held in Wallace, a meeting being held simultaneously by some of the stockholders in Minneapolis. The company's property is on Pine creek. The meeting is said to have been a stormy session, lasting until 1 o'clock in the morning. Directors elected are James F. Howarth of Wallace, C. A. Bloomquist, treasurer of Minneapolis; Fred W. Sachse, Benjamin E. Harmon and Tom J. McGrath of St. Paul. Bloomquist will become president; Sachse, vice-president; McGrath, treasurer; Harmon, secretary, and Benjamin G. Harmon, assistant secretary and general manager. The officers will be elected at a meeting to be held in Minneapolis. John F. Nordquist has been president. Benjamin G. Harmon voted over half of the stock of the company. This company formerly was controlled by LeRoy Hooper, B. N. Barnett, Rush J. White, John Nordquist and Charles Solberg of Wallace.

Kellogg.

"Net returns from our first carload of antimony concentrates are $2784," said H. J. Hibschmann, vice-president of the Coeur d'Alene Antimony Mining Co. "This is most gratifying. Our plant is running 10 and 12 hours a day and will have another car ready early next week, and hereafter will have at least 3 a month. Twenty men are at work. Within the last few days men were sent in behind the lagging in the tunnel, where they found good ore. They followed the dip and discovered that increased values were obtained until now the best ore we have is there. Electric power from the Washington Water Power Co. will be installed in a few days. The saving in power will materially help profits. It also will be increased by the higher percentage of value in the concentrates."

Hailey.

The American Smelting & Refining Co., which controls the Federal Mining & Smelting Co., operating several properties in the Coeur d'Alenes, has taken over the North Star-Triumph groups of lead-silver-zinc claims, near here, and E. Percy Smith, for the last 4 years assistant general manager for the Federal, has been appointed to superintend development and operation of the new holdings. Frank M. Estes, who has opened offices for the American Smelting & Refining Co. in Spokane, has been sent here to investigate desirable new properties, and the acquisition of the North Star-Triumph groups is the first result of his activities. In his annual 1915 report, Robert N. Bell, state mine inspector, has the following to say of the North Star-Triumph properties: "At the North Star and Triumph mines, also on the East fork of Wood river, an extensive resource of base zinc-lead-silver ore that it is believed will aggregate 100,000 tons of mineral above its bottom development levels, carrying about 15% zinc with 8% lead and 8 ozs. silver, is the subject of serious consideration at the present time. The ore is extremely base by a complication of massive arsenical pyrite association."

LAKE SUPERIOR.

COPPER.

Houghton.

Hancock has received from its concentrates, mass and barrel work, that come from Quincy No. 7 shaft and which has been smelted at the Quincy smelter, about 60,000 lbs. of copper. This copper runs very high, reaching 102 and even 103%, according to the International Standard of Conductivity. The high grade of conductivity of this mine's copper coming from its own shaft is rather remarkable, as it is taken from five lodes.

Lake Superior voted for its new program of dissolving the old company and joining with the Magma in the organization of a new company 72% of the outstanding stock. The legal papers are now being prepared—a task that will take some time—so that the old companies can be dissolved and the new consolidated company organized. The plan is very satisfactory to the stockholders.

Houghton Copper has 72 ft. covered by a crosscut at the

12th level in search of the West vein without meeting with any copper of value, but this was expected, as in places at the Superior mine the distance between the two lodes was 200 ft. About the same distance on the Superior lode in a southern drift has been opened up and the drill, owing to the poor facilities of removing the dirt, has to be worked at the drift and then at the crosscut.

Calumet & Hecla is now doing considerably better than for the first of the month and is milling about an average of 10,280 tons daily. This is rather remarkable, as about the most the mines can do is to hold to the figures of last month. This copper is of course from the Calumet conglomerate and the Osceola amygdaloid.

Tremont-Devon has finished its drilling for the present after having drilled three holes, two on the same dip and the third a quarter of a mile away. The second hole was quite shallow, being drilled for the purpose of learning the dip of the formations in case it was desired to sink a shaft later. The third was placed at a distance on the strike to ascertain the persistence of the lode on the strike. It is known that an unidentified lode, called by the management the Devon, was found in the first hole lying just above the Forrest lode on which the Victoria is mining with a very good showing, and that in the third hole the Victoria disclosed very good values, but beyond this the management have not given out anything, as they state they have not had a chance to examine the second core and the first part of the third at the end.

Adventure is now getting ready its surface equipment, getting its supplies and preparing to retimber the collar of the shaft and the shaft itself, before it can start to unwater; consequently it will be about 2 weeks or so before it is prepared to start the pumps. The good news from the Michigan as to the richness of the Butler lode is most promising for the Adventure, even if a distance of 415 ft. to the southeast has to be covered by a crosscut to reach it; that is, from the Knowlton lode, on which the shaft is located.

Osceola Con. will shortly start up No. 3 North Kearsarge, which was suddenly closed down a year ago last November by the explosion of one of its boilers, so as to gradually make up what is lost by the gradual exhaustion of the good ground at South Kearsarge, and therefore it will resume on a very small scale. The tonnage can be increased as desired, as when it discontinued mining operations it was sending up 1000 tons daily. The shaft repairs that are now being carried on will be continued until finished. The tonnage will be this month about 115,000, as compared with 108,000 for April, owing principally to the fact that May had 27 working days as against 24 for April.

White Pine Extension will commence again to sink the shaft, which has been bottomed at the depth of 54 ft. for about 3 weeks to allow the headframe and rockhouse to be completed. The rock in the shaft was of the most satisfactory character.

Franklin's average tonnage for the month will be about 1000 tons higher than April, and it will get a better yield, as more stopes are being opened, and one after the other the levels are coming into the spectacular territory about 300 ft. south of the shaft. About 700,000 lbs. of mineral were produced in the mill last month and there will be over 800,000 lbs. this month. The long crosscut out east from the shaft on the 32nd level will not be pushed any further for some time, as the men are needed in getting out rock, but later on it will be resumed and probably driven a mile further to the New Arcadian lode.

Victoria is greatly hindered in its production by being obliged to cut over into the new skipway so as to open up raises from several levels and hoist its poor rock, so that last month the output of mineral was only about 80 tons, as against about 100 in March. Owing to various unforeseen and unavoidable delays the new skipway and hoisting engine will not be ready until about Aug. 1. The steam plant for running the mill, when the water is low, is being installed quite close to the mill. There is plenty of good rock blocked out that can be hoisted when the new engine and skipway are ready.

Isle Royale is holding up to 2900 tons a day and is doing over 1000 ft. of development work monthly. No. 7 shaft has been holed up two levels from 7th, the bottom, to the 5th, and is now down from the surface about 200 ft., but it will probably take about 3 months to connect with the 5th. The quality of the rock is continuing to be about the same.

North Lake will just as soon as the loading station at the 8th level is completed, which will be in a few days, crosscut in both directions for the very promising lodes located by diamond drill holes 4 to 5 years ago.

Keweenaw found the width of the old Phoenix fissure to be 22 ft., and along the west wall that was entered first there is a strip of 14 ft. of very heavy copper—small mass and barrel work mixed with good shot copper—and then another strip of similar values, 4 ft. wide, near the east wall, the fissure being almost vertical. As soon as the fissure was passed through, a very good quality of shot copper, the best rock so far encountered, was run into, and it is being found to continue up to the present time about 65 ft. distant. This last occurrence of the rich metal is peculiarly gratifying, as it is about the same kind of rock, if not a little better in grade, that was found when the crosscut from the 6th level came into the foot-wall side about 1285 ft. east of the drift's face. The trestle and other preparatory work for the mill is being hurried along as fast as possible, and the test will be begun sometime before Aug. 1. All the other openings are up fully to the average as far as developed. There is every indication that this mill test will run high, judging from rock that is being taken out.

IRON.

Ishpeming.

The state tax commission has decided that the assessment of the properties at Norway will be reduced from $1,642,281 to $1,619,449. Iron Mountain mines will be assessed the same as last year, $3,309,445. Crystal Falls valuations are boosted from $1,489,242 to $1,582,380, and Bessemer reduced from $2,990,670 to $2,901,059. The figures for the other districts are in course of preparation. They will be approximately the same as in 1915.

Operations on the Marquette ranges are lively. One of the most important features of the Cleveland-Cliffs Co. is the development of the Holmes mine near the Junction location. The work started Jan. 10 and the shaft has been put down 300 ft. It will be necessary to go down to the 1050-level before ore is struck. The shaft has been concreted down to the ledge and has steel construction all the way. Sixty men are employed. The present equipment consists of 2 steam hoists, a 150-hp. boiler, a drill-sharpening and forge outfit, a dry and an office. Air is furnished from a tap in the pipe line running between the Cliff-Shafts and North Lake mines. New buildings to be put up in the near future consist of an engine house, steel shaft house 140 ft. high, with dry house and shops. The machinery will be electrically driven. This summer the ground for stockpiles will be graded and branches built in from the L. S. & I. and D., S. S. & A. railroads. The property will not produce until 1917. An interesting Cleveland-Cliffs property is the Section 6 open pit. Stripping has been going on steadily and will finish this week. It is possible that some of the ore will be mined with steam shovel, but the greater part will be milled into raises from the fourth level of the Lloyd shaft and hoisted through that shaft to surface. Besides this 2 more diamond drills have been placed on Section 2 and this makes a total of 3 drills now prospecting this ground.

Oliver has one shovel each working at Section 16 mine, Queen mine, Negaunee, and the Stegmiller mine at Gwinn. An important work here is the remodeling and enlarging of the crusher at the Hard Ore property. The siding has been taken off the building, and the work is going on steadily. Most of the ore mined by this company goes to Escanaba over the lines of the North Western. A very small portion, however, is being sent to Marquette.

MISSOURI-KANSAS.

Joplin, Mo.

On West Twentieth street Goodwin & Co. are erecting a small mill to treat old dump piles that have accumulated from hand jig work in years when ore prices were low. These old dumps still yield a good zinc return, and while being worked

the ground will be developed. The ground is shallow and a number of old shafts are available for reopening the lease.

Hartzell, Chadwick & Co. are developing a mill prospect on a 29-acre lease of the Granby land in old Possum hollow, west of Joplin. The company has a shaft down to 155 ft., at which point considerable drifting has been done. The new shaft is directly north of the old one, in which a soft ground ore deposit was worked.

The old Erickson mine on the Horton land at Diamond, southeast of Joplin, is being reopened by John Ruhl & Co. of Carthage. The ground will be drained and the work taken up where it was dropped a number of years ago. The mine was at that time a fair prospect, but owing to low prices was not developed.

Taking over the lease of the Gilt Edge Mining Co., 2 miles east of Tipton Ford, the Wade Mining Co. has undertaken to build a concentrating plant. The lease consists of 120 acres, and has been developed by shafts and drilling. The ore deposit is found at a depth of 40 to 80 ft., and both lead and jack is found. The owners believe the ore will carry 10% zinc and lead. The mill will be designed to treat both tailings and ore. John L. Fay, president; C. E. Benton, vice-president, and Frank J. Bane, secretary, all of St. Louis, and Evan W. Buskett, treasurer, of Joplin, constitute the officers.

On the Henry Weyman land west of Diamond a party of prospectors have developed a calamine deposit that is turning out a good tonnage. The shaft is down to the 110-level, and a drift 40 ft. long has been cut into the deposit. The face exposed is 10 ft. high. With 3 men in the ground a production of 3 tons per day is being made.

Webb City, Mo.

F. C. Wallower contemplates the early rebuilding of his concentrating plant at the Cumberland mine, which was destroyed by fire a few weeks ago. The power plant was saved. The plant was one of the leading producers in the Prosperity camp, and its production was an important addition to the output. Owing to the difficulty of getting motors in the district, and the fact that electric power facilities are limited until the Empire District Power Co. completes its new power plant, probably means some delay in getting the plant back to early production.

Barber Gibson has a 350-ton concentrating plant nearly completed on the old Premier lease north of Webb City. The plant is located on the site of the old Premier plant, and a new shaft is being sunk to supply ventilation and also a greater ore tonnage. The plant will be one of the most modern in the field, electrically driven and with every device for slime saving. This is the third mill to be built by Gibson.

Plans are being made for adding still another concentrating plant to the National Zinc & Lead Co. lease on McCorkle hill in Webb City. The company's new plant there is now making a car of concentrates per week, and a new shaft is being sunk to open up more territory. The new mill is turning out concentrates running 63 to 64% zinc.

Still another new zinc smelter has been planned and launched, this time being made up of Webb City men under the corporate name of the Missouri Zinc Smelting Co. The company acquires the property now operating at Rich Hill. The stockholders of the corporation are M. R. Lively, W. H. Robertson and W. M. Robertson, all of Webb City.

T. F. Coyne of Webb City has recently acquired a lease on the old Victor ground of the Connor Realty Co. at Prosperity and will immediately start its development after a long idleness. The new lease will be known as the Tom C. No. 3.

Galena, Kas.

Sheldon and Childress have undertaken to drain the old Peacock camp. They have also undertaken to build a huge dike along the river to prevent any further flooding of the property once the water is out. The dike is already well along toward completion and the pumps have been installed and started. While this work is in progress the company has also started a mill which was placed on the site of the old Sparks and Henderson plant, which burned down some years ago following the flood which put them out of business. This old camp was one of the greatest the district has ever had and constituted the cream of the United Zinc Co.'s holdings for many years. After the land is drained there will be a large amount of land subleased to other operators.

MONTANA.

Butte.

Unwatering shaft and repair work at the Alice mine is going forward. The shaft had been retimbered practically down to the 600-level. All through the district improvements in the mining properties are being steadily carried on. The Rae shaft, with a depth of about 200 ft. and located on the Rising Star claim, has been reopened and cleaned out. Foreman Tonkin of the Poulin has had charge. At the Pilot-Butte the shaft and machinery are undergoing repairs and all the underground workings are being put in shape for operation. The Anaconda will make the Pilot-Butte one of its operating shafts. All these mines carry good values in zinc and they will be in readiness for beginning work by the time the Anaconda concentrator is completed and ready.

According to President Charles H. Bowman of the Montana School of Mines, Butte stands an excellent opportunity of securing the federal bureau of mines, which is to be established at some point in the northwest. Bowman states, however, that the people should be prepared to offer to provide for part of the bureau's maintenance, as the community that lands the plum must be willing to co-operate with the government to that extent. According to news dispatches from Washington, the government probably will establish three bureaus of this kind, one in the northwest, one in Alaska and one at some point in the south. The suggestion has been made that Butte make a bid for one of the bureaus and President Bowman, who naturally would be interested in seeing it established here, has investigated with the result that he believes Butte stands a fair chance to get the institution.

The Syndicate Copper Mining Co. has filed articles of incorporation with the clerk and recorder. The capital stock is $100,000, divided into 20,000 shares of $5 each. The directors named for the first 3 months are W. E. Reynolds, W. W. McDowell, J. W. Pratt and Paul A. Gow.

Helena.

If the tests now being made by the Anaconda Copper Mining Co. of the Porphyry Dike property near Rimini show that the rhyolite flows carry commercial values, the property will be one of the biggest low-grade mines in the world, according to Marcus L. Hurley of New York, the engineer in charge of the work. Between 40 and 45 miners are now employed in the testing operations, and in a few days the 20-stamp mill will be put into full operation, the muck from each working face being milled to determine the average values. The test work will be completed in about 8 months. Hurley said that good miners, men who can run the machine drills, are scarce, and a new method was recently inaugurated under which the good miners are given contracts and are making from $7 to $8 a day.

At Elliston, 29 miles west of Helena, there are good prospects of resuming work on the Julia mine, 9 miles south of Elliston. The mine is owned by the Montana-Clinton Copper Co., of which C. L. Fredericks is head. The Julia has been considerable of a producer in its day. It was located by George Mack about 20 years ago, and was purchased by the present owners in 1911. For the 3 years prior to the war 162 cars of ore were shipped to the smelter, which brought $30 per ton at the smelter.

Net profits of the Franklin mine in the Scratch Gravel district for May were $11,000.25, according to the report of the executors of the Cruse estate filed in the district court. Receipts were $19,099.93, and disbursements $8,099.68. Total profits since April, 1914, aggregate $185,498.72.

NEVADA.

Tonopah.

The crosscut from the winze below the 1200 level of the Tonopah mine has penetrated the Murray vein for 6 ft. with no sign of the opposite wall. The ore is of good milling grade and the management anticipates a good tonnage of profitable ore from this point. Development of the vein will

be later pressed from the 1140 and 1350 levels. The mill is treating about 2800 tons per week with 72 stamps dropping.

The new unit of 10 stamps has been installed in the Tonopah Extension mill together with a tube mill. Two agitators, a Dorr thickener, filter and stock tanks will be placed in position at once. It is expected to have everything in working shape by July 1. A heavy production by way of the Victor shaft will also start about the same time. Developments on the 1100, 1250 and 1350 levels are being energetically prosecuted from No. 2 shaft.

A. E. Lowe has been appointed superintendent of the North Star mine, succeeding the late J. W. Chandler. The vein in the drift on the 850 level continues to show 30 ins. of good ore, and a 2-ft. shoot of low-grade material is showing in the raise from the 900 intermediate. Occasional small shipments are made to the West End mill.

Goldfield.

Developments in Jumbo Extension ground north of the Velvet shaft are becoming highly interesting. The north crosscut from the 780 level has proven the big ore body at this point to range from 80 to 100 ft. wide, with numerous shoots of profitable ore occurring. One shoot averages 4 ft. wide and assays $17. At another point ore of milling character shows across a width of 10 ft. To the south rich ore is coming from the main workings. Ore bins at the Velvet shaft have been practically completed and most of the ore will hereafter be hoisted through the new workings. Dividend No. 7 has been declared, at the rate of 5 cts. per share payable June 30 to stockholders of record June 1.

The New Jersey Mines Co. is hoisting ore for shipment from the 330, 400 and 500 levels of the Exchequer shaft. A winze has been sunk from the 400 level from which point drifts will be extended to pick up the vein. The ore carries gold and silver. Harry Ernest is superintendent.

Bonnie Clare.

The tailings and dumps below the Bonnie Clare mill have been taken under lease by H. M. Clifford, George W. Quigley and John Manion of Tonopah, and arrangements made for immediate erection of a flotation plant. The tailings include about 25,000 tons from ore milled for the Jumbo Extension Co., estimated to be worth $4 in copper and silver. The Bonnie Clare Co. is reported to have opened good ore along the foot wall in the Courier and Rattlesnake claims.

Virginia City.

Four men were burned to death in a fire in the Yellow Jacket mine May 23; 12 men were rescued. The fire started in the compressor room and spread to the shaft and adjoining levels despite desperate efforts of the fire fighters to check the flames. The financial loss is considered serious. The mine is owned by the Jacket, Crown Point & Belcher Mining Co., in which Pittsburgh people are heavily interested.

Cornucopia.

The Leopard silver mine has been taken under bond by A. H. Cutright representing Salt Lake investors. A large tonnage of excellent ore is stated to be exposed underground, and the dumps contain vast quantities of lower-grade material. The mine was formerly a noted producer but was closed following the drop in silver prices about 25 years ago. The new operators are contemplating the building of a mill. George Russell is the owner.

Lovelock.

"On the 9th of May a body of ore measuring 30 ins. in width and assaying $1,484.80, was cut at the face of the 1600 north drift, 45 ft. from the main winze station," says President L. A. Friedman, of the Seven Troughs Coalition Mining Co., in his opening statement in the annual report of the company which has just been mailed to stockholders. "After first running due north for 30 ft. to allow for ample unloading and pumping facilities, an acute turn to the left was made into the hanging wall, where preliminary surveys had determined the position of the vein. Fifteen feet further advancement brought us squarely across this most remarkable ore body, and as 10 days subsequent development has shown no perceptible change, we believe that we are again into an ore shoot of unusual size and richness. The rake of this shoot will take it directly across our main winze at about 60 ft. below the 1600 level, and within the next 2 weeks, which time will be required for preliminary preparations, sinking will be resumed. Making due allowance for possible delays, 60 days will see us into the heart of the ore with our principal working winze. In the meantime extensive developments will be prosecuted contiguous to the 1600 level."

Supplemental to President Friedman's statement are some interesting figures in the report which aside from stockholders will be of moment to the general public. For the year ending April 30, 1916, the ore returns of the company amounted to $335,735.64, which with rentals, lights for Seven Troughs and royalties, brought the total up to $337,577.47. Total direct operating costs and expenses amounted to $214,561.80, leaving an excess of income over direct operating costs and expenses of $123,015.67. The total administrative and general expense amounted to $26,574.64, which left an operating profit of $96,441.03. Adding interest on notes receivable, the net profit for the period amounted to $98,977.69. Although nothing is said in the report about dividends for the present year, it is generally understood that the quarterly payments will be met regularly. The report shows that dividends Nos. 3, 4, 5, 6 and 7, paid June 1, Sept. 1, Dec. 1 and 23, 1915; and April 1, 1916, amounted in all to $180,382.10. With a surplus of cash on hand, a wonderful ore body opening in the mine, conditions are very promising for Coalition this year.

Sodaville.

The Atkins-Kroll Co. is building a 100-ton tungsten concentrating plant at this point. Large reserves of good grade ore are exposed in the mine. The company recently purchased the entire townsite, water rights and much outlying land. About 100 men are on the payroll.

Hilltop.

John McGovern has discovered a vein of rich silver ore in Bateman canyon. It is 3 ft. wide, averages around 20 ozs. silver, and was found at a depth of 50 ft. Several other claims have been located, including a promising location by Charles Hawkinson.

Rochester.

Sixty-ounce ore across 7 ft. is showing in the south drift on the West vein of the Rochester Mines Co. The work is being pushed and will soon emerge from the Crown Point Claim No. 1 into the Weaver No. 2, demonstrating a wonderful ore reserve, heretofore uncounted in the massing of the company's tonnage. Work to the north, particularly toward the north end of Block 3, or the old Four J workings, is progressing in most satisfactory manner on both the East and West veins. A body of ore is shown in these workings along the 150-vertical level that is returning $25 across 5 ft. Up to date this is declared to be the West vein, but the same showing is evident in the East vein and a coalition of the two seems to be imminent. This junction will occur on the strike and may prove consistent on the dip as further north work demonstrates actual conditions.

Ely.

Tungsten discoveries at Cherry creek, 50 miles north of Ely, are bringing that old-time camp into prominence once more. Salt Lake people who were fortunate enough to obtain information regarding the first discoveries there early last fall, have been quietly gathering in property for several months, until they now control a large acreage of very promising tungsten ground.

Earnest Kimball last October was joined by Judge Legrande Young of Salt Lake in a deal for the original group of six claims that were owned by George Boyle of Osceola, and Joe Nelson and Milton Hamilton of Cherry Creek. Since that time they have acquired three other groups embracing 21 claims on or contiguous to the contact of quartzite and lime in which the main tungsten zone is found, and covering a length of about 3 miles on the contact.

From 5 to 10 men have been employed doing general prospecting work up to the present time, and considerable high-grade ore has been extracted. On one claim there are some old workings made in the days of silver mining and it has been discovered that the dumps contain a large amount of scheelite. Arrangements are now being made to organize a company and also a milling company, the latter to be conducted on a custom basis for the treatment of this company's ores and others in the district. It is probable that the old Wild West mill at Cherry Creek may be taken in under the milling

plans. The main vein following the contact ranges from a few feet up to about 30 ft., and tests show that a conservative estimate would place the tungsten content at about 1½% across the vein. Kimball recently sent out a shipment of 400 lbs. of handsome assorted ore that returned 60.7%. The property is located about 7 miles from rail; water and timber are plentiful for large operations.

Jarbidge.

The Bluster mill is running again and on a better grade of ore than last fall. During the winter a large amount of ore was blocked out and several new ore bodies found, showing larger values in both gold and silver.

The Buckeye arastra has been started up on $40 ore and is running very satisfactorily. Considerable ore has been broken down in the mine during the winter by the lessees and they should have a very profitable summer's run.

The Long Hike, which has been just 6 months in developing into a mine, has $9,000,000 estimated in proven ore and bids fair to rank as one of the great mines of the state.

The Starlight is developing well and can show 6 ft. of $100 ore.

A 500-ft. tunnel is to be run on the Legitimate to cut the vein at an additional depth of 250 ft. Ben Olson and Judge C. O. Westcott of Tacoma, who are interested, have been here examining the progress of work and were very much pleased with their own property, as well as with the other mines of the camp.

The Small mill on the Flaxie has been running along on $50 ore and developments in the mine are quite satisfactory.

George Wingfield has had J. O. Greenan, a Boston engineer, here for some time examining and sampling the Success and Bluster mines on which he has a bond. Wingfield's advent into the camp again would mark a great advance in the future prospects of this district. Both the Success and Bluster mines have considerable quantities of ore blocked out.

NEW MEXICO.

Twining.

John B. Bidwell, vice-president of the Taos Copper Mining Co., will begin operations at once driving a tunnel into the mountain. It is the intention of the company to work the property on a large scale during the coming summer. A. C. Probert, Santa Fe, N. M., is president of the company.

Silver City.

With the majority of its present 50 members located in this district, the New Mexico chapter of the American Mining Congress has been formed. Their charter will be received about June 6. This was brought about through the efforts of E. L. Walcott. Officers elected were: Governor, John M. Sully, Santa Rita; first vice-governor, T. H. O'Brien, Dawson; second vice-governor, George H. Utter, Silver City; third vice-governor, E. M. Sawyer, Tyrone; treasurer, T. L. Lowe, Silver City; secretary, Don W. Lusk, Silver City; directors, C. T. Brown, Socorro county; T. H. O'Brien, Colfax county; E. D. Tittmann, Sierra county; W. C. McDonald, Lincoln county; E. A. Miera, Sandoval county; Gregory Page, McKinley county; L. Bradford Prince, Santa Fe county; John M. Sully, Grant county; A. T. Kirk, Bernalillo county; J. A. Mahoney, Luna county; Evan Fraser-Campbell, Dona Ana county; George A. Kaseman, Bernalillo county; J. L. Lawson, Otero county; J. M. Palmer, San Juan county; Juan M. Vigil, Santa Fe county; Charles A. Spiess, San Miguel county; George H. Utter, Grant county; E. M. Sawyer, Grant county; executive committee, John M. Sully, chairman; C. T. Brown, George H. Utter, E. M. Sawyer and T. H. O'Brien.

OREGON.

Harney.

Casing to be placed in the deep well sunk on Dog mountain in Harney county by the Oregon Oil & Gas Co. has been delivered at the well and J. C. Turney, manager, has begun putting it in place. The casing was hauled by motor truck all the way. This is the largest amount of casing ever brought into the state. Drilling came to a standstill because of the flow of water encountered at several levels. W. G. Howell, Portland, has been assisting in development work.

Susanville.

At the Thompson Mining Co.'s property the development has reached a point that gives assurance that it can be operated at a profit. The shaft is down 140 ft. At the bottom a drift has been run 175 ft. Assays in the shaft show an average of $5.48 gold and $25.60 silver, the latter figured at the rate of 50 cts. In the drift practically the same values prevail, but along the hanging wall there is a narrow streak of ore that is very rich. Three tests show $329, $254 and $175 gold. A tunnel has been started to cut the vein about 400 ft. below the bottom of the shaft, and when this was extended about 50 ft. a blind lead was encountered. In crosscutting it showed a uniform value of $4.40 gold, a little silver and 1.10 ozs. platinum. Passing from the 22 ft. of porphyry the tunnel cut about 10 ft. of serpentine, a characteristic formation of that section, and then came 6 ft. of andesite with an average value of $2 in gold. Leaving the andesite the tunnel has run 15 ft. through vein material that carries $5.20 gold and considerable silver. The crosscut is still in the vein, and it is probable other disclosures will follow.

UTAH.

Pingham.

Approximate figures of the Utah Metal & Tunnel Co. are given as quick assets $1,250,000 and monthly earnings $100,000. Besides considering a 50-ct. dividend for July it contemplates the installation of flotation cells. At the mill an average of about 225 tons of ore a day is being handled, although the mill has been speeded up to 275. The installation of a flotation plant would allow an increase in tonnage of 15 to 25 and increase the present savings. Besides a carload of ore an average of 100 tons of crude ore a day are being sent the smelter from the Bingham-New Haven and the Utah Metal properties. The last ore body opened up in the Utah Metal is the fourth that has been developed. It is showing up satisfactory as the other three from which a large tonnage has already been shipped. From the 750-level of the Bingham-New Haven a drift is being sent out to catch the ore bodies in the Utah Metal end. This will be 300 ft. below the present ore bodies and will cut their extension. There remains but 300 ft. of drifting to get under the ore. At the Utah Metal main tunnel which connects Bingham with Middle Canyon considerable new development work is being carried on. The Bingham-New Haven has now been almost entirely taken up by the Utah Metal & Tunnel Co.

American Fork.

It is somewhat late, but the first hauling from this district was started about May 24, and as yet the snow is still delaying operations at several properties. At the Texan mine the upper tunnel is in about 600 ft. The ground has been badly broken and the face at present requires spiling. A porphyry dike has been cut and is said to have shown some mineralization. In the lower tunnel the dike has also been cut and the face of the tunnel is in the solid quartzite.

At the Pacific a vein has been opened that in one place shows a width of 22 ft. and has been followed for 900 ft. Ore is shown throughout the entire distance and is shown from the lowest level to the old workings 200 ft. above. The vein runs north and south. It was opened by the lower tunnel 1000 ft. from the portal and 200 ft. below the old workings. It has only been followed 30 ft. to the south. Practically all the work has been to the north along the vein. A short distance north of the tunnel an east and west porphyry dike crosscuts the vein. This threw the ore about 10 ft. west. Beyond this point it is richer than to the south. At one point where a crosscut has been made to the hanging wall there is 18 ins. of ore that carries 20% copper and 500 ozs. silver. At places the vein matter for the entire distance across the fissure would pay to ship and by sorting a high-grade shipping

ore could be secured and the rest would make milling ore. Another strike is in the drift on the vein to the north. Here ore dipping across the drift has been encountered that is 5 ft. thick, 15 ft. long and goes both up and down. It shows copper glance throughout and probably carries values in silver. The ore has dipped to the west and flattened out in the face of the drift and therefore shows but a few inches in width. Following the foot wall a raise has followed high-grade ore and in one place 120 ft. above the lower tunnel there is a stope of almost solid galena. From this place five 50-ton cars of ore were shipped. There are 2 mill dumps of about 10,000 tons each which can be concentrated to a $70 value. Besides this there is a large amount of ore blocked out and ready to ship. The bins are also filled to capacity.

Park City.

According to F. B. Cook of the New Quincy, development is progressing. The recent strike, which is making in a bedding plane, had been crosscut for a distance of about 18 ft. at the time of his visit and was showing 10 ft. of ore in the breast. Ore is being broken for shipment. Grab samples taken of each mine car loaded show that it will return between 28 and 45 ozs. in silver. The strike was made in a raise up 233 ft. above the 900-level of the Daly West crosscut. The ore was encountered in the east drift at the top of the raise, 1200 ft. from surface and 500 ft. east of the Harrington raise. When the drift along the main fissure was driven some time ago a considerable quantity of ore was broken in the fissure and stored in the drift, for the reason that at the time it would not pay to ship the ore. Orders were given to have the ore taken out of the drift, with the idea of shipping it, and, while inspecting the drift after it had been cleaned out, he began picking into the north side and found the ore to be continuing in that direction. A round of shots was put in and the ore found to be making in the bedding plane between the limestone formation. Inasmuch as the bedding extends along the east-west drift, there is a possibility of picking up the ore body for a distance of about 500 ft. in length by driving crosscuts to the north from the drift at various intervals. At a point about 550 ft. to the west of the strike of the bedded deposit and in the fissure responsible for the bedded deposits 3½ ft. of silver ore has been struck that runs $65

W. D. Lewis of the Daly Judge Extension Co. says: "Work has been started to the east of Clayton's peak. A small force of men is now at work, but as fast as room is made for more the miners will be employed. The work now is being done in a winze from the bottom level of the 90-ft. shaft. It is down 90 ft. and is following what is believed to be the same ore body as is now being developed in the New Quincy ground. The property lies to the east of Snake Creek tunnel and arrangements for doing deep development through that tunnel may be made later. Good ore is showing in three places on the property on which the principal development consists of a 700-ft. tunnel and a 90-ft. shaft. In the tunnel a narrow streak of ore carries 1.5 to 4% copper, 16% lead, with 40 ozs. silver. By sinking the shaft about 100 ft. deeper the contact should be reached and along it the finding of good ore bodies is expected. Copper ore shows in the bottom of the shaft.

Eureka.

The Vicksburg Gold & Copper Co.'s property has been leased by the United States Mines Operating Co., the first car of ore has been shipped. The property is in the Star district. In the main drift 16 ins. of shipping ore is exposed. It has been driven to the west from the bottom of the 40-ft. shaft and along the ore-bearing fissure for 130 ft. Due to the topography of the surface, depth is being gained rapidly as the drift is advanced, approximately 40 ft. of depth being gained as the drift is advanced 100. Lying immediately underneath the ore body in the face of the drift is from 14 to 16 ins. of manganese. The ore body and the manganese are surrounded by a soluble limestone. The ground consists of 5 claims, located along a belt of limestone for 4000 ft. and which is cut by ore-bearing fissures. The shaft is down 40 ft. on the main ore-bearing fissure. It is to be sunk to the 200-level as soon as the necessary machinery is installed, which consists of power drills and air compressor. As soon as the shaft is driven down 50 ft. another station will be cut and laterals driven along the ore-bearing fissure. This plan is to be continued at intervals of 50 ft.

WASHINGTON.

Spokane.

The mining region in northern Washington, particularly in Stevens county, is responding more to the revival of interest in the mining industry than any other part of the northwest, not even excepting the Coeur d'Alenes, according to Sidney Norman, general manager of the Norman Mines Co., which has the Great Western and Last Chance mines under lease and bond, who returned recently from an extended automobile tour of the district. "I inspected the Electric Point mine soon after its discovery early in 1915, and at that time I predicted that it would prove a great high-grade lead deposit. My estimate of the value of the property was discredited at the time, but subsequent development has demonstrated it. The company now has more than 1000 tons of ore on the dump, ready for shipment as soon as the road to the state highway is completed, that will run from 75 to 80% lead, and I have been informed by the manager that there are a number of cars of sulphide ore in storage that will run from 25 to 30% lead. There are 85 men employed constructing the wagon road from the mine to the main highway, and this probably will be ready for heavy traffic in a few weeks. In addition there are 15 to 20 men doing development at the property and getting out ore for shipment. Two new discoveries, almost as important as the original, have been made at the Electric Point recently, and a syndicate of Spokane investors now is negotiating for a quarter interest in the company at a price that is said to establish the value of the holdings at approximately $1,000,000. While I was in the district it was reported that there had been several new discoveries in other properties in Stevens county that had been dormant for years, and there is not a developed mine in the region but has resumed operations. The Dead Medicine group, one of the pioneer producers of the northwest, is working again, and the old Aladdin mine, north of Bossburg, which was operated 30 years ago by the late Colonel I. N. Peyton of Spokane, the product being transported on pack mules to the railway at Spokane, also is being revived. These are but a few instances showing the unusual activity in mining in northern Washington, and scores of others could be cited."

A Spokane syndicate, headed by Walter Nicholls, has purchased 200,000 shares of Electric Point Mining Co. stock from J. Peeper of Coeur d'Alene for $125,000. The initial payment of $40,000 was paid Thursday, May 25, and the remaining $85,000 will be paid as soon as the transfer of the shares is completed. The Nicholls syndicate also has purchased two groups of claims adjoining the Electric Point holdings, and Jesse M. Hall, field man for Nicholls, has gone to the properties to superintend construction of camp buildings preparatory to beginning active development. The groups were secured from the original locators, and Nicholls states that one has practically the same surface showings as the Electric Point, while the other is believed to be equally promising. The Electric Point mine was located last June by J. E. Yoder and Chris C. Johnson, prospectors, of Northport, with whom was associated as grubstaker Roy A. Young, lumberman, of Aberdeen and Northport. In September, after a small amount of surface work had resulted in a disclosure of galena and lead carbonate ore, they formed the Electric Point Mining Co. to take over the mine and operate it. Each took 200,000 shares of the capital stock in payment for the property and the balance was put in the treasury. Since then 200,000 shares of treasury stock have been sold at prices ranging from 32½ to 75 cts. a share, making the issued capital of the company 800,000 shares. In October Peeper secured from Johnson an option to purchase his entire stock holdings for $22,500, paying down $1 to bind the bargain. Subsequently he made cash payments to Johnson of $2000 and $5000, as provided in the agreement of sale, the money being furnished in the first instance by Charles McKinnis of Wallace and in the second case by H. F. Samuels. These loans, together with the balance due Johnson he paid prior to the completion of the sale to Nicholls and associates. The profit to Peeper and his backers on the temporary investment of $7001 was consequently $102,499. The Electric Point mine is 11 miles

southeast of Northport and 14 miles by wagon road from Boundary, its shipping point on the Spokane Falls & Northern railroad. It occupies the summit and slopes of a high mountain in the chain dividing the Columbia and Pend Oreille valleys, and is at an altitude of 5000 ft., or 3600 ft. above the Columbia river. The main surface showings consist of three chimneys of ore, that first discovered being in the center. The discovery showing has been opened by a glory hole exposing a body of solid ore circular in form and measuring 35 ft. in diameter. On this ore body a shaft has been sunk 210 ft., with drifts and crosscuts on the 100 and 200-levels which prove the shoot to maintain its size and grade at least to that depth. On the lower level drifts are now being run to tap the two other chimneys, the No. 2 shoot being 40 ft. to the south and No. 3 180 ft. to the north on the strike of the vein.

Northport.

There is great activity in Northport, where the Northport Smelting & Refining Co. recently began operating its new $1,000,000 smelter, even more than the period when the old Le Roi smelter was in operation.

WISCONSIN-ILLINOIS.

Highland.

Shipments of carbonate zinc ore were made from this district last week at $40 and $45 per ton, according to grade. Eagle-Picher Lead Co., a new amalgamation of smelter interests, were buyers. Officials of the New Jersey Zinc Co. made an inspection of its mines and prospects in this district It is proposed to put 200 miners to work. A score of small operating companies are rigged up with new wash places and are cleaning ore for market.

Montfort.

Deferred shipments of zinc ore at the O. P. David mine is responsible for the accumulation of several hundred tons of fair-grade zinc ore. Prices on medium and low-grade ores have suffered sharp cuts recently and operators at all points in the field are now holding in reserve about 4000 tons of concentrates.

Linden.

New York interests have recently secured an option on several zinc producers in this district. Engineers are on the ground.

The Linden Zinc Refinery Co. after a shut down due to repairs is again running. About 10 cars of high-grade ore will be delivered within the next 10 days. Shippers for the week are the Saxe-Pollard Co., Linden Development Co., Optimo Co. Nos. 1 and 2, and Ross Bros.

Mifflin.

Increased production is noted at the Coker mines, from which 8 cars of zinc ore were shipped last week to Mineral Point Zinc Co. The Peacock Mining Co., with newly installed tramming facilities, is running full time. Several hundred tons of concentrates are being held by the Senator Mining Co., a low-grade producer. M. & A. Mining Co. are making good headway in the construction of a 200-ton power and concentrating outfit. Rundell mines are developing new runs of ore extending from the old Sunrise lease into adjoining properties. Shipments last week were heavy, 15 cars of concentrates clearing. Mineral Point locals turned in small lots to furnace at Mineral Point.

Platteville.

The Wisconsin Mining School graduated a class of 15 on Friday last, two of whom are subjects of the Sultan of Turkey. The school closed one of the most successful years in its career, the class of 1916 being the largest so far from this institution. Ralph Davis, director of the school and instructor in geology, is given credit for the progress being made.

Shipments of zinc ore from the various camps show for week ending May 27 were 122 cars, 4981 tons. Six cars of lead ore cleared during this week, 487,590 lbs. Shipments of pyrites were light, coming only from the National Separating Works at Cuba, 517,560 lbs. The gross yield of crude concentrates totaled 3832 tons; net deliveries to smelter, 2623 tons. The Mineral Point Zinc Co. delivered 17 cars of high-grade refinery ore to smelter at DePue, 619 tons. A decided drop in the price of ore was noted for the week, $80 to $83 ruling for top grades, as against $90 for week before; seconds were down to $75 assaying down to 52% zinc content. The lower grades suffered by comparison, and much low-grade ore was carried over in bin. Local producers were not much in evidence, the Hodge shipping 4 cars to Cuba, 172 tons, and the Star mine, 1 car to LaSalle, 44 tons.

Regardless of declining zinc ore markets production continues in this camp. Shipments for week of May 27 included the following: Calvert to American Metals Co., 4 cars, 167 tons; Burr mine and Bull Moose mines to Grasselli Chemical Co., 10 cars, 453 tons; Fox and Penna-Benton mines to Mineral Point Zinc Co., 8 cars, 368 tons; Blackstone, Martin and Kittoe mines to separating plant at Cuba, 12 cars, 496 tons; Fields Mining and Milling Co. to Galena Refinery Co., 7 cars, 280 tons; Wisconsin Zinc Roaster at New Diggings, high-grade refinery zinc ore to LaSalle, 42 tons; American Zinc Co., 3 cars, 124 tons; Lanyon Zinc Co., 3 cars, 100 tons, and to Granby Mining & Smelting Co., 4 cars, 153 tons; Champion, 1 car of low-grade ore to Galena, 57 tons.

Good roads recently built have invited the general use of auto trucks for hauling ore and several cars have been introduced, with excellent results. More operators are planning to adopt this means of transportation.

Extensive drilling operations are being pursued in this section, 30 machines being engaged in both Benton and New Diggings townships. Numerous strikes are recorded, some of phenomenal proportions, notably that of the Greater Mining Co., which has cleaved 46 ft. of milling area from 103 to 149 ft. The Frontier Mining Co. is also meeting with success in drilling on the Hird land. A new shaft is going down for this company on the Grotkin lease to tap ore deposits drilled out. The milling area blocked with drills insures extensive production for many years to come.

Hazel Green.

Shipments continued heavy from the Kennedy mine last week, 6 cars going to Mineral Point, 247 tons. This mine has been in constant operation for 22 years. Lawrence to Galena, 3 cars, 120 tons, and Cleveland to Mineral Point, 88 tons.

Shullsburg.

Rodhams Mining Co. is working concentrates piled up some time ago, 4 cars being shipped last week. Winskill mine to Galena, 1 car, 45 tons.

Galena.

Shipments of high-grade zinc ore were made by the Galena Refining Co., 6 cars, 240 tons, to Granby; Wisconsin Zinc Roasters, 3 cars, 120 tons, to LaSalle; 1 car to Lanyon Zinc Co., 40 tons; Black-Jack, Federal, North Unity and Dinsdale, the last-named a new producer, to separators, 7 cars all told, 287 tons.

Cuba.

National Separators received 22 cars of raw ore last week, 933 tons. Shipments of high-grade refinery ore were made to Illinois Zinc Co., 3 cars, 126 tons; to Granby Mining & Smelting Co., 5 cars, 204 tons. The plant handles 150 tons daily. No further improvements are planned this year. Raisbeck Mining Co., a new producing concern, shipped 1 car of zinc ore last week and 1 the week before. Utt-Thorne Co. delivered 4 cars to roasters at Benton, 160 tons.

WYOMING.

Cody.

The Midwest Sulphur Co. is going to enlarge its plant from 4 to 12 tons capacity. The works will cost $20,000. The construction has already started. Within the next few months the plant will be completed and will be able to compete with the foreign production that has long dominated prices on the Pacific coast. Under normal conditions brimstone and flour sulphur has been selling at $20 to $25 a ton. Contracts are now being made for the product at $35 to $40 a ton. The cost of producing sulphur allows a large profit, as Midwest quarries the material. The work was only started last year. From June to December the company made profits

of $7100. Already 1800 t[illegible] produced. The company own[illegible] large amount of sulphur that will run 10% brimstone. The material has been opened [illegible] and a width of 150. The sulphur also has been opened for an extent of 350 ft. The indications are strong that the material will be found to extend for 1500 to 1800 ft. The company is capitalized for $60,000, divided into 300,000 shares. The present financing is being done by J. A. Hogle & Co., Salt Lake City, Utah.

CANADA.

BRITISH COLUMBIA.

Three Forks.

The net earnings of the Rambler-Cariboo Mining Co., with mines and a mill at Three Forks, were $123,500 for the fiscal year ended April 30, 1916, according to a preliminary report sent to stockholders by the directors. The annual meeting will be held June 13 at Three Forks, and these figures will be incorporated in the yearly statement of operations. The directors announce that they have decided to distribute dividends for the current fiscal year every 60 days, instead of monthly, as heretofore, to curtail expenses as much as possible and to obviate the work of sending out so many checks, as the stockholders are scattered over a wide area. They state also that the property is in excellent physical condition, and that there is enough ore in sight to keep the mill operating at capacity for the next 2 years. Since May 1, 1915, development aggregated 1360 ft., confined principally to the 700, 800, 900, 1000 and 1200 levels, opening new ore bodies on each of the levels except the 1300, which will have to be driven farther north to get under the shoot exposed in the next upper workings. During the year the concentrator was operated 20 hours daily, but it soon will be in operation three 8-hour shifts. There were 21,000 tons of ore milled during the period, producing 1800 tons of concentrates that carries 1,292,644 lbs. of lead and 142,066 ozs. silver, and 630 tons of concentrates that returned 472,871 lbs. of zinc and 14,689 ozs. silver. This does not include 500 tons of zinc concentrates shipped in April, from which smelter returns have not been received, nor 500 tons of zinc concentrates still stored at the mill.

Zincton.

The financial difficulties of the Lucky Jim Zinc Mines Co. seem in a fair way of adjustment, according to the first annual report of Andrew G. Larson of Spokane, who several months ago was appointed trustee for the corporation by Judge Gregory of British Columbia. Larson states that, despite serious difficulties in carrying on operations, due to the lack of mill and railroad facilities, he has paid into court $15,000 on account of the mortgage on the property, and expects to be able to make a further payment of $5000 early in June. If the mill at Rosebery which is handling the Lucky Jim ore were equipped with machinery for the retreatment of middlings these sums, he says, could have been increased by $10,000 or $12,000. An important matter he has been able to adjust, thereby effecting a saving to the company of practically $30,000, was the claim of the Canadian Pacific railroad to the right to charge $2 a ton on Lucky Jim ore, until $35,000 in all had been paid as refund on the cost of a spur used by the company as a part of its main line to Kaslo. Better smelter contracts also were obtained, which on the April shipments alone increased earnings $900. In the settlement of the difficulty with the railroad a refund of $2940 was obtained.

ONTARIO.

Toronto.

Returns made to the Bureau of Mines by the metalliferous mines and works of the province for the first 3 months of 1916, show increases in all products except iron ore. Following are the figures, those for the corresponding period of 1915 being added for comparison:

Gold, ozs.	76,307	101,818
Silver, ozs.	5,230,167	5,297,831
Copper, tons	2,614	5,491
Nickel, tons	6,680	10,032
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
Arsenic, metallic, lbs.	4.0	26,160
Nickel, metallic, lbs.	[illegible]	31,976
[illegible]	18,224	143,212

The value of the production for the first 3 months of 1916 was $14,276,382, as compared with $9,358,210 for the corresponding period of last year. This large increase was due not only to the greater output, but to the higher prices now prevailing for most of the metals.

Gold.—The increase in the yield of gold was 31,511 ozs., worth $656,872. Compared with the rate of production for the whole of last year the advance was less marked, but developments now under way are likely to lead to a substantial increase. Porcupine provided the bulk of production, namely 99,282 ozs. Hollinger led in output, followed by Dome, Acme, McIntyre-Porcupine, Porcupine Crown, Vipond, Schumacher and Dome Lake in descending order. The mines situated elsewhere making up the remainder of the yield are Tough-Oakes and Croesus. Consolidation of the Hollinger, Acme and Millerton interests will no doubt lead to a more extensive development and a greater output from these properties.

Silver.—A feature of the quarter was an actual increase in the yield of silver as compared with the first 3 months of 1915, amounting to 67,664 ozs. In value the increase was proportionately greater, namely $462,673. This was due to the remarkable rise in the price of silver, amounting to about 50% over the average figure for 1915. A large part of this increase took place in the latter part of the quarter and afterwards, consequently the benefit of the higher prices was only partially realized during the 3 months. The natural effect of the advance has been to stimulate both mining and prospecting in Cobalt and to enable low-grade ores in the mines or on the dumps to be worked, which at the former low prices of silver were without value. Nipissing continues to lead in quantity of output; Townsite-City, Seneca Superior, Kerr Lake, LaRose, Coniagas, Cobalt Lake, McKinley-Darragh-Savage, Beaver, etc., follow in the order named.

Nickel and Copper.—The demand for nickel and copper, due to the war, has been insatiable, and the Sudbury mines have shown a capacity for meeting the requirements which could scarcely have been anticipated. The output of nickel and copper in the matte was each 50% greater than in the first 3 months of 1915. If the present rate of production is maintained throughout the year, 1916 will see about 40,000 tons of nickel and 22,000 tons of copper turned out by the smelters in the Sudbury district, as against 34,000 tons of nickel and 19,600 tons of copper in 1915. The Canadian Copper Co. and the Mond Nickel Co. are the producers; the Alexo mine turning out a small quantity of ore which is sold to the Mond Co.

Iron.—The blast furnaces of the province produced about 70% more pig iron than they did in the first quarter of 1915, and the product was worth almost 100% more. About 15% of the iron ore charged into the furnaces was taken from deposits in Ontario, the remainder coming from the United States.

By-Products of Silver.—Cobalt oxide and nickel oxide met with a rather better demand, though the quantities exported are still below those of normal times. Metallic cobalt is coming into use, principally in steel alloys, and there is now a small quantity of nickel refined in Ontario from the silver-cobalt ores of the Cobalt camp.

MEXICO.

The delayed report of the Agua Prieta customs house shows that 16 mines at least were operating in Sonora during April. The new mining tax law promulgated by Carranza, while increasing the American Smelting & Ref. Co.'s taxes between four and five times, will not hit the company severely, as most of its properties come under the $6 a year rate, covering 1 to 50 claims. It is holders of large groups of claims which will suffer most from new law. Just at present, with their mines closed down, the company will not be affected by the export tax now to be imposed of 10% ad valorem on gold and silver and [illegible] on other metals. In addition, there is ordinary state tax of 2%. Export tax will exert some pressure on company when its mines resume.

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A Weekly Classified Index to Current Periodical and other Literature, Appearing the World Over Relative to Mining, Mining Engineering, Metallurgy and Related Industries, in Four Parts.

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I. GEOLOGY

GEOLOGY AND MINERALOGY

Geology

Higgins, W. C.—*Mine and Mill of Bannack Gold Mining Co., Utah.* [A description of the deposit and mine workings. The mill has a continuous, counter-current decantation].—S. L. Mg. Rev. May 15 1916; p 17; pp 4½*; 25c

Matson, G. C.—*The Caddo Oil and Gas Field, Louisiana and Texas.* [Complete set of geological sections and topographic map are included with a description of the formation and mode of occurrence of the oil and gas].—U. S. G. S. Bull. 619; pp 62*; 40c.

Overbeck, R. M.—*A Metallographic Study of the Copper Ores of Maryland.* [A lengthy review of the geology, genesis, mineralogy, petrology and nature of these deposits].—Eco. Geol. April 1916; p 161; pp 43*; 60c.

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II. ORES AND METALS

(I) METALS AND ORES

Chromium

Doelter, C.—*Die Mineralschätze der Türkei.* [Gives separate briefs on the mineral resources of Turkey, including chromium, iron, gold, antimony, silver, lead, mercury and copper].—Montaniste. Rund. April 16 1916; p 217; pp 4; 35c.

Edwards, C. A.—*Initial Temperatures and Critical Cooling Velocities of a Chromium Steel.* [A paper read before the Iron & Steel Inst. Curves showing the results of the investigations are given].—I. & C. Tr. Rev. May 5 1916; p 513; pp 1*; 35c.

Copper

Anderson, L. D.—*Mechanical Feeding as Applied to Silver-Lead Blast Furnaces.* [Reviews the operations and methods used by the U. S. Sm. & Ref. Co., Midvale, Utah].—E. & M. J. May 20 1916; p 885; pp 3¾*; 25c.

Doelter, C.—*Die Mineralschätze der Türkei.* [Gives separate briefs on the mineral resources of Turkey, including chromium, iron, gold, antimony, silver, lead, mercury and copper].—Montanist. Rund. April 16 1916; p 217; pp 4; 35c.

Lyon, D. A.; Keeney, R. M.—*Feasibility of Western Electro Metallurgy.* [Discusses the pig iron, steel, copper and zinc smelting in electric furnaces and gives costs on the same. It is concluded with a talk on the hydro-electric power question].—Jnl. Elect. Power & Gas April 29 1916; p 331; pp 3¾*; 35c.

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Fischer, H.—*Effect of Black Slate on Cyanidation.* [The results of a number of tests in tabulated form are given and accompanied with description of the tests].—M. & S. P. May 20 1916; p 743; pp 2¾; 20c.

Higgins, W. C.—*Mine and Mill of Bannack Gold Mining Co., Utah.* [A description of the deposit and mine workings. The mill has continuous, counter-current decantation].—S. L. Mg. Rev. May 15 1916; p 17; pp 4½*; 25c.

Palmer, L. A.—*The Oatman District, Arizona.* [Describes the mines, their development and present activities].—E. & M. J. May 20 1916; p 895; pp 5¼*; 25c.

——— *Alaska Juneau Gold Mining Co., Alaska.* [Details of mining and milling operations].—E. & M. J. May 20 1916; p 911; pp 1¼; 25c.

——— *Use of the Slide Rule in Cal-*

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Gold Milling, Metallurgy, Etc.

See Mill and Milling, Metallurgy, Chemistry, Assaying, Etc.

Iron Ores and Mining

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Estep, H. C.—*How Steel Is Made in Alabama.* [Gives a complete description of the Gulf States Co.'s plant and describes its operation and products used and produced].—I. Tr. Rev. May 18 1916; p 1091; pp 8⅓*; 25c.

Kind, R.—*Die Entwicklung und Bedeutung der Eisenindustrie Belgiens.* [A review of the iron industry in Belgium].—Montanist. Rund. April 16 1916; p 227; pp 2; 35c.

Iron and Steel

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Ronceray, E.—*Indications pour la Fabrication des Obus en Fonte Ordinaire et en Fonte Aciérée.* [On the constituents and metallography of cast iron of ordinary and special kinds].—Revue Pratiq. Ind's. Metlgq. May 1916; p 1; pp 3½; 40c.

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Thompson, F. C.—*Surface Tension Effects in the Intercrystalline Cement in Metals and the Elastic Limit.* [A paper read before the Iron & Steel Inst].—I. & C. Tr. Rev. May 5 1916; p 515; pp 1*; 35c.

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Estep, H. C.—*How Steel Is Made in Alabama.* [Gives a complete description of the Gulf States Co.'s plant and describes its operation and products used and produced].—I. Tr. Rev. May 18 1916; p 1091; pp 8⅓*; 25c.

Kniepert, K.—*An Improvement in Open-Hearth Practice.* [Abst. from an article in Stahl und Eisen].—Iron Age May 18 1916; p 1191; pp 1½*; 30c.

McKnight, W. M.—*Some Faults of the Small Electric-Arc Furnace for Melting and Refining Steel.* [A paper read before the Am. Chem. Soc.].—Mg. World May 20 1916; p 955; pp 1½; 10c. Jnl. Elect. Power & Gas May 13 1916; p 376; pp 1¼; 35c.

——— *Bethlehem's New Electric Steel Plant.* [The Girod furnace is used. Hot metal will be refined and both high carbon and alloy steels produced].—Iron Age May 18 1916; p 1194; pp 1¾*; 30c.

——— *Small Open Hearth for Foundries.*—I. Tr. Rev. May 25 1916; p 1148; [illegible] 25c.

Lead

Anderson, L. D.—*Mechanical Feeding as Applied to Silver-Lead Blast Furnaces.* [Reviews the operations and methods as used by the U. S. Sm. & Ref. Co., Midvale, Utah].—E. & M. J. May 20 1916; p 885; pp 3¾*; 25c.

Doelter, C.—*Die Mineralschätze der Türkei.* [Gives separate briefs on the mineral resources of Turkey, including chromium, iron, gold, antimony, silver, lead, mercury and copper].—Montanist. Rund. April 16 1916; p 217; pp 4; 35c.

Schoskel, B. H.—*History of the Development of Jo Daviess County, Illinois.* [Is given in connection with the geology and geography of this zinc-lead bearing district].—Ill. Geol. Surv. Bull. 26; pp [illegible]

Trowbridge, A. C.; Shaw, E. W.—*Geology and Geography of the Galena and Elizabeth Quadrangles.* [This includes the zinc deposits of the Wisconsin-Illinois district and is accompanied with an account of the history of the development of this section of the country].—Ill. Geol. Surv. Bull. 26; pp 233*.

——— *Conversaciones Sobre Contribucion Minera.* [Some contributions and talks on the mineral industry of South American countries. Copper, lead and petroleum are the principal things considered].—Inf. y Mem. Soc. Ing. Peru. Dec. 1915; p 535; pp 26; 75c.

Silver

Anderson, L. D.—*Mechanical Feeding as Applied to Silver-Lead Blast Furnaces.* [Reviews the operations and methods as used by the U. S. Sm. & Ref. Co., Midvale, Utah].—E. & M. J. May 20 [illegible]

Doelter, C.—*Die Mineralschätze der Türkei.* [Gives separate briefs on the mineral resources of Turkey, including chromium, iron, gold, antimony, silver, lead, mercury and copper].—Montanist. Rund. April 16 1916; p 217; pp 4; 35c.

——— *Lawyer Gold Mines, Ltd., Report for* 1915.—Canadian Mg. Jnl. May 15 1916; p 253; pp 2¼; 35c.

Silver Milling, Metallurgy, Etc.

See Mill and Milling, Metallurgy, Chemistry, Assaying, Etc.

Tantalum

Moir, James.—*Analysis of Niobium-Titanium Minerals, with Some New Tests for Niobium, Tantalum and Titanium.*—Jnl. Chem. Met. & Mg. Soc. S. Afr. Mar. 1916; p 189; pp 2; 85c.

Waites, T. P.—*Notes on Rare Metals in Madagascar.* [Uranium, niobium and tantalum are the minerals considered].—Jnl. Chem. Met. & Mg. Soc. S. Afr. Mar. 1916; p 187; pp 2; 85c.

Tin

——— *Annan River Company's Pumping Plant, Cooktown Tinfields.* [Detailed figures are given on this pump for a tin-dredging proposition in Queensland].—Queen. Govt. Mg. Jnl. April 15 1916; p 161; pp 1*; 35c.

——— *Bucket Dredging in Northern Nigeria.* [Some details are given in this general description of placer tin-dredging].—S. Afr. Engg. April 1916; p 63; pp 1*; 35c.

Tungsten

Hibbs, J. G.—*Boulder County Tungsten District as It Is Today.* [A general review of current conditions and operations in the Boulder field, Colo.].—Mg. World May 20 1916; p 953; pp 1¾; 10c.

McDonald, P. B.—*Tungsten Mining in the West.*—M. & S. P. May 20 1916; p 757; pp 1½; 20c.

Zinc

Liebig, M.—*Das Ununterbrochene Zinkgewinnungsverfahren nach Roitzheim und Remy, Deutchland.* [Describes the method of continuous zinc smelting at Roitzheim and Remy, Germany].—Metall & Erz Mar. 22 1916; p 143; pp 13*; 50c.

Lyon, D. A.; Keeney, R. M.—*Feasibility of Western Electric Metallurgy.* [Discusses the pig iron, steel, copper and zinc smelting in electric furnaces and gives costs on the same. It is concluded with a talk on the hydro-electric power question].—Jnl. Elect. Power & Gas April 29 1916; p [illegible]

Schoskel, B. H.—*History of the Development of Jo Daviess County, Illinois.* [Is given in connection with the geology and geography of this zinc-lead bearing district].—Ill. Geol. Surv. Bull. 26; pp 233*.

Trowbridge, A. C.; Shaw, E. W.—*Geology and Geography of the Galena and Elizabeth Quadrangles.* [This includes the zinc deposits of the Wisconsin-Illinois district and is accompanied with an account of the history of the development of this section of the country].—Ill. Geol. Surv. Bull. 26; pp 233*.

Miscellaneous Metals and Ores

Moir, James.—*Analysis of Niobium-Titanium Minerals, with Some New Tests for Niobium, Tantalum and Titanium.*—Jnl. Chem. Met. & Mg. Soc. S. Afr. Mar. 1916; p 189; pp 2; 85c.

Waites, T. P.—*Notes on Rare Metals in Madagascar.* [Uranium, niobium and tantalum are the minerals considered].—

Jnl. Chem. Met. & Mg. Soc. S. Afr. Mar. 1916; p 187; pp 2; 35c

(II) NON-METALS

(A) FUELS 6 pt

Coal Fields and Mining

Ball, L. C.—*Oil Shales and Coal at Sugarloaf, Queensland.* [The nature and quality of the materials are described].—Queen. Govt. Mg. Jnl. April 15 1916; p 165; pp 2¾*; 35c

Harris, D. M.—*Dangers of Machine Mining in Anthracite Coal.* [A paper read before Safety First Organization of the Delaware, Lackawanna & Western].—Coal Age May 20 1916; p 874; pp 2¼*; 20c.

Pirsson, L. V.; Schuchert, C.—*A Textbook of Geology.* [A very complete treatise on physical and historic geology with chapters on Clinton iron ore and coal].—Wiley & Son; book; pp 1051*; $1.

Pirsson, L. V.; Schuchert, C.—*A Textbook of Geology.* [A very complete treatise on physical and sistoric geology with chapters on Clinton iron ore and coal].—Wiley & Son; book; pp 1051*; $4.

Teil, B.—*Die Montanindustrie im Königreiche Polen.* [The coal mining industry in the kingdom of Poland].—Kohleninteressent April 15 1916; p 57; pp 2; 35c.

——— *Year Book for* 1910 *of the Illinois Geological Survey.* [Includes the Administrative report and various economic geological papers].—Ill. Geol. Surv. Bull. 20; pp 165*.

Coke

Barber, C.—*Coking, the Recovery and Working-Up of By-Products.* [A paper read before the Sheffield Univ. Gas & Coke Oven Students' Assn. This part is on the manufacture of sulphuric acid as a by-product].—I. & C. Tr. Rev. May 5 1916; p 518; pp 2¾*; 35c.

Thaler, H. — *Experimentelle Untersuchung des Siegerländer Spiegeleisenhochofens.* [Successful experimental work with coke ovens producing spiegel-iron].—Berg & Hütten. Rund. Mar. 5 1916; p 33; pp 5½; 35c.

Petroleum

Liwehr, A. E.—*Die Erdölförderung aus Bohrlöchern.* [A new machine for boring petroleum wel's].—Zts. Zentral Verbd. Bergbau Betriebsl. Mar. 15 1916; p 77; pp 6*; 35c.

Matson, G. C.—*The Caddo Oil and Gas Field, Louisiana and Texas.* [Complete set of geologic sections and topographic map are included, with a description of the formation and mode of occurrence of the oil and gas].—U. S. G. S. Bull. 619; pp 62*; 40c.

Velardez, Julio.—*El Petroleo del Comodoro Rivadavia.* [On the production and conditions of the industry in Peru and other parts of South America].—Inf. y Mem. Soc. Ing. Peru Dec. 1915; p 517; pp 8½; 75c.

——— *Conversaciones Sobre Contribucion Minera.* [Some contributions and talks on the mineral industry of South American countries. Copper, lead and petroleum are the principal things considered].—Inf. y Mem. Soc. Ing. Peru Dec. 1915; p 535; pp 26; 75c.

——— *Gasoline Question.* [A general discussion on the same and its production, as well as that of petroleum insofar as it bears on the gasoline market].—M. & S. P. May 20 1916; p. 753; pp 3¾*; 20c.

——— *Year Book for* 1910 *of the Illinois Geological Survey.* [Includes the Administrative report and various economic geological papers].—Ill. Geol. Surv. Bull. 20; pp 165*.

Natural Gas

Matson, G. C.—*The Caddo Oil and Gas Field, Louisiana and Texas.* [Complete set of geological sections and topographic map are included with a description of the formation and mode of occurrence of the oil and gas].—U. S. G. S. Bull. 619; pp 62*; 40c.

——— *Year Book for* 1910 *of the Illinois Geological Survey.* [Includes the Administrative report and various economic geological papers].—Ill. Geol. Surv. Bull. 20; pp 165*.

III. TECHNOLOGY

MINES AND MINING

Ore Reserves

Doelter, C.—*Die Mineralschätze der Türkei.* [Gives separate briefs on the mineral resources of Turkey, including chromium, iron, gold, antimony, silver, lead, mercury, and copper].—Montanist. Rund. April 16 1916; p 217; pp 4; 35c.

Smith, G. O.—*The Public Interest in Mineral Resources.* [Discusses the subject from the point of interest as a resource and asset to the country and not individual owners of mines only].—Min. Res. of U. S.; T:A; pp 9.

——— *Year Book for* 1910 *of the Illinois Geological Survey.* [Includes the Administrative report and various economic geological papers].—Ill. Geol. Surv. Bull. 20; pp 165*.

Drilling and Boring

Harris, D. M.—*Dangers of Machine Mining in Anthracite Coal.* [A paper read before Safety First Organization of the Delaware, Lackawana & Western].—Coal Age May 20 1916; p 874; pp 2¼*; 20c.

Hirschberg, C. A.—*Subway Excavating Revolutionized.* [From the Mg. World. In some detail gives the methods of using machine drills in this work].—Comp. Air May 1916; p 7971; pp 5*; 20c.

Kennedy, E. P.—*Study of Machine Drilling at Treadwell Mines, Alaska.* [From the E. & M. J.. Gives data and description on results of drilling].—Comp. Air May 1916; p 7976; pp 1¾; 20c.

Liewehr, A. E.—*Die Erdölförderung aus Bohrlöchern.* [A new machine for boring petroleum wells].—Zts. Zentral Verbd. Bergbau Betriebsl. Mar. 15 1916; p 77; pp 6*; 35c.

Tunnels and Tunneling

Comstock, A. E.—*Pneumatic Concrete Mixing, Conveying and Placing.* [Abst. of a paper read before the American Concrete Inst.].—Comp. Air. May 1916; p 7982; pp 2½*; 20c.

Hirschberg, C. A.—*Subway Excavating Revolutionized.* [From the Mg. World. In some detail gives the methods of using machine drills in this work].—Comp. Air May 1916; p 7971; pp 5*; 20c.

Dredging

Alderson, M. W.—*Mining Possibilities in Colombia, South American.* [Considerable of the article is on gold dredging operations and the general conditions surrounding the same in that country].—Mg. World May 20 1916; p 947; pp 3½*; 10c.

Indian Rare Company's Pumping Plant, Cooktown Tinfields. [Detailed figures are given on this pump for a tin-dredging proposition in Queensland].—Queen. Govt. Mg. Jnl. April 15 1916; p 161; pp 1*; 35c.

——— *Bucket Dredging in Northern Nigeria.* [Some details are given in this general description of placer tin-dredging].—S. Afr. Engg. April 1916; p 63; pp 1*; 35c.

Production

Teil, B.—*Die Montanindustrie im Königreiche Polen.* [The coal mining industry in the kingdom of Poland].—Kohleninteressent April 15 1916; p 57; pp 2; 35c.

Velardez, Julio.—*El Petroleo del Comodoro Rivadavia.* [On the production and conditions of the industry in Peru and other parts of South America].—Inf. y Mem. Soc. Ing. Peru Dec. 1915; p 517; pp 8½; 75c.

——— *Conversaciones Sobre Contribucion Minera.* [Some contributions and talks on the mineral industry of South American countries. Copper, lead and petroleum are the principal things considered].—Inf. y Mem. Soc. Ing. Peru. Dec. 1915; p 535; pp 26; 75c.

——— *Gasoline Question.* [A general discussion on the same and its production, as well as that of petroleum in so far as it bears on the gasoline market.]—M. & S. P. May 20 1916; p 753; pp 3¾*; 20c.

——— *Southern Rhodesian Mining.* [Gives the. production of minerals and metals from that country].—S. Afr. Engg. April 1916; p 61; pp 1; 35c.

——— *Year Book for* 1910 *of the Illinois Geological Survey.* [Includes the Administrative report and various economic geological papers].—Ill. Geol. Surv. Bull. 20; pp 165*.

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Alderson, M. W.—*Mining Possibilities in Colombia, South America.* [Considerable of the article is on gold dredging operations and the general conditions surrounding the same in that country].—Mg. World May 20 1916; p 947; pp 3½*; 10c.

Sperr, F. W.—*Stoping by Branched Raises.* [A method of particular use in the mining of large bodies of soft ore, as the iron deposits of Lake Superior].—M. & S. P. May 20 1916; p 750; pp 2½*; 20c.

——— *Alaska Juneau Gold Mining Co., Alaska.* [Details of mining and milling operations].—E. & M. J. May 20 1916; p 911; pp 1¼; 25c

MILL AND MILLING

Flotation

Dwyer, C. E.—*Tonnage Formulas.* [A chart combining tons of feed, acid used and oil used].—M. & S. P. May 20 1916; p 737; pp 1¾*; 20c.

Rosenblatt, G. B.—*Direct Drive for Flotation Machines.* [The motive power for each flotation cell is made by a separate direct connected electric motor].—Mg. World May 20 1916; p 957; pp 1½*; 10c.

——— *Breaking Down Froth in Flotation Work.* [Describes a recent attachment for breaking up the froth as it comes from the machine].—Mg. World May 20 1916; p 951; pp 1¾*; 10c.

Cyaniding

Fischer, H.—*Effect of Black Slate on Cyanidation.* [The results of a number of tests in tabulated form are given and accompanied with description of the

tests].—M. & S. P. May 20 1916; p 743; pp 2¾; 20c.

Higgins, W. C.—*Mine and Mill of Bannack Gold Mining Co., Utah.* [A description of the deposit and mine workings. The bill has continuous, counter-current decantation].—S. L. Mg. Rev. May 15 1916; p 17; pp 4½*; 25c.

Mill Miscellany

Dwyer, C. E. *Tonnage Formulas.* [A chart combining tons of feed, acid used and oil used].—M. & S. P. May 20 1916; p 737; pp 1¼*; 20c.

Ralston, O. C.—*The Control of Ore Slimes.* [Published by permission of the U. S. Bur. of Mines. Deals with the effect of heat and other agencies in the settling of slimes. Curves of various kinds are reproduced].—E. & M. J. May 20 1916; p 890; pp 4¾*; 25c.

——— *Alaska Juneau Gold Mining Co., Alaska.* [Details of mining and milling operations].—E. & M. J. May 20 1916; p 911; pp 1¼; 25c.

CHEMISTRY AND ASSAYING

Chemistry

McGrigor, G. D.—*Field Analysis of Minerals.* [The methods are mostly chemical].—Mg. Mag.; book; pp 88*; $1.

Moir, James.—*Analysis of Niobium-Titanium Minerals, with Some New Tests for Niobium, Tantalum and Titanium.*—Jnl. Chem. Met. & Mg. Soc., S. Afr. Mar. 1916; p 189; pp 2; 85c.

Moir, James.—*Some New Methods of Testing for Molybdenum.* [Chemical methods for the qualitative analysis of the mineral].—Jnl. Chem. Met. & Mg. Soc. S. Afr. Mar. 1916; p 191; pp 1; 85c.

Analysis

McGrigor, G. D.—*Field Analysis of Minerals.* [The methods are mostly chemical].—Mg. Mag.; book; pp 88*; $1.

Moir, James.—*Analysis of Niobium-Titanium Minerals, with Some New Tests for Niobium, Tantalum and Titanium.*—Jnl. Chem. Met. & Mg. Soc., S. Afr. Mar. 1916; p 189; pp 2; 85c.

METALLURGY

Electrometallurgy

Lyon, D. A.; Keeney, R. M.—*Feasibility of Western Electro Metallurgy.* [Discusses the pig iron, steel, copper and zinc smelting in electric furnaces and gives costs of the same. It is concluded with a talk on the hydro-electric power question].—Jnl. Elect. Power & Gas April 29 1916; p 331; pp 3¾*; 35c.

McKnight, W. M.—*Some Faults of the Small Electric Arc Furnace for Melting and Refining Steel.*—Jnl. Elect. Power & Gas May 13 1916; p 376; pp 1¼; 35c.

Thermic Metallurgy

Anderson, L. D.—*Mechanical Feeding as Applied to Silver-Lead Blast Furnaces.* [Reviews the operations and methods as used by the U. S. Sm. & Ref. Co., Midvale, Utah].—E. & M. J. May 29 1916; p 885; pp 3¾*; 25c.

Austin, L. S.—*The New Bag House at the Midvale Smelter, Utah.* [Line drawings of the smelter, its arrangement and some of its equipment].—M. & S. P. May 20 1916; p 746; pp 2¾*; 20c.

Bondolfi, Fausto.—*Un Capitolo di Siderurgia Applicata.* [A chapter on the application of metallurgy and metallography to iron and steel].—La Met. Italiana; Mar. 31 1916; p 165; pp 37*; $1.

Liebig, M.—*Das Ununterbrochene Zink-Verfahren [illegible] Remy, Deutch-Land.* [Describes the method of continuous zinc smelting at Roitzheim and Remy, Germany].—Metall & Erz March 22 1916; p 143; pp 13*; 50c.

Metallurgy, General

Jacobs, E.—*Metallurgical Improvements in British Columbia.* [Speaks of the advances made by several companies operating there].—Canadian Mg. Jnl. May 15 1916; p 252; pp 1½; 35c.

Schiefer, H. V.—*Sintering Plant Installed at Toledo.* [Describes a complete plant for unloading, storing, preparing and sintering direct and stock pile flue dust].—I. Tr. Rev. May 25 1916; p 1155; pp 6½*; 25c.

POWER AND MACHINERY

Electricity

McKnight, W. M.—*Some Faults of the Small Electric-Arc Furnace for Melting and Refining Steel.* [A paper read before the Am. Chem. Soc.]—Mg. World May 20 1916; p 955; pp 1½; 10c.

Rosenblatt, G. B.—*Direct Drive for Flotation Machines.* [The motive power for each flotation cell is made by a separate direct connected electric motor].—Mg. World May 20 1916; p 957; pp 1½*; 10c.

——— *Bethlehem's New Electric Steel Plant.* [The Girod furnace is used. Hot metal will be refined and both high carbon and alloy steels produced].—Iron Age May 18 1916; p 1194; pp 1¾*; 30c.

Hydro-Electric

Lyon, D. A.; Keeney, R. M.—*Feasibility of Western Electric Metallurgy.* [Discusses the pig iron, steel, copper and zinc smelting in electric furnaces and gives costs on the same. It is concluded with a talk on the hydro-electric power question].—Jnl. Elect. Power & Gas April 29 1916; p 331; pp 3¾*; 35c.

Compressed Air

Comstock, A. E.—*Pneumatic Concrete Mixing, Conveying and Placing.* [Abst. of a paper read before the American Concrete Inst.]—Comp. Air. May 1916; p 7982; pp 2½*; 20c.

Hirschberg, C. A.—*Subway Excavating Revolutionized.* [From the Mg. World. In some detail gives the methods of using machine drills in the work].—Comp. Air May 1916; p 7971; pp 5*; 20c.

Kennedy, E. P.—*Study of Machine Drilling at Treadwell Mines, Alaska.* [From the E. & M. J. Gives data and description on results of drilling].—Comp. Air May 1916; p 7976; pp 1¾; 20c.

——— *Loss of Power in Compressors.* [Brings out causes which will make a mechanical loss in the air compressor].—S. L. Mg. Rev. May 15 1916; p 21; pp 2*; 25c.

IV. MISCELLANEOUS

Miscellaneous Costs

——— *Conversaciones Sobre Contribucion Minera.* [Some contributions and talks on the mineral industry of South American countries. Copper, lead and petroleum are the principal things considered].—Inf. y Mem. Soc. Ing. Peru Dec. [illegible]

Testing

Fischer, H.—*Effect of Black Slate on Cyanidation.* [The results of a number of tests in tabulated form are given and [illegible] description of the tests].—M. & S. P. May 20 1916; p 743; pp 2¾; 20c.

Kennedy, E. P.—*Study of Machine Drilling at Treadwell Mines, Alaska.* [From the E. & M. J. Gives data and description on results of drilling].—Comp. Air May 1916; p 7976; pp 1¾; 20c.

Ralston, O. C.—*The Control of Ore Slimes.* [Published by permission of the U. S. Bur. of Mines. Deals with the effect of heat and other agencies in the settling of slimes. Curves of various kinds are reproduced].—E. & M. J. May 20 1916; p 890; pp 4¾*; 25c.

Thaler, H.—*Experimentelle Untersuchung des Siegerländer Spiegeleisenhochofens.* [Successful experimental work with coke ovens producing spiegel-iron].—Berg & Hütten. Rund. Mar. 5 1916; p 33; pp 5½; 35c.

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Bondolfi, Fausto.—*Un Capitolo di Siderurgia Applicata.* [A chapter on the application of metallurgy and metallography to iron and steel].—La Met. Italiana; Mar. 31 1916; p 165; pp 37*; $1.

Cubillo, D. L.—*La Teoria de las Fases y Su Applicacion al Estudio de la Solucion Hierro-Carbono.* [A treatise on the solution of carbon in steel].—Revista Minera Mar. 16 1916; p 133; pp 1½*; Mar. 24; p 145; pp 1¾; 70c.

Edwards, C. A.—*Initial Temperatures and Critical Cooling Velocities of a Chromium Steel.* [A paper read before the Iron & Steel Inst. Curves showing the results of the investigations are given].—I. & C. Tr. Rev. May 5 1916; p 513; pp 1*; 35c.

Ronceray, E.—*Indications pour la Fabrication des Obus en Fonte Ordinaire et en Fonte Aciérée.* [On the constituents and metallography of cast iron of ordinary and special kinds].—Revue Pratiq. Ind's. Metlgq. May 1916; p 1; pp 3½; 40c.

Thompson, F. C.—*Surface Tension Effects in the Intercrystalline Cement in Metals and the Elastic Limit.* [A paper read before the Iron & Steel Inst.].—I. & C. Tr. Rev. May 5 1916; p 515; pp 1*; 35c.

History

Schoskel, B. H.—*History of the Development of Jo Daviess County, Illinois.* [Is given in connection with the geology and geography of this zinc-lead bearing district].—Ill. Geol. Surv. Bull. 26; pp 233*.

Trowbridge, A. C.; Shaw, E. W.—*Geology and Geography of the Galena and Elizabeth Quadrangles.* [This includes the zinc deposits of the Wisconsin-Illinois district and is accompanied with an account of the history of the development of this section of the country].—Ill. Geol. Surv. Bull. 26; pp 233*.

Financial

——— *Beaver Consolidated Mines, Ltd., Report for 1915.*—Canadian Mg. Jnl. May 15 1916; p 253; pp 2¼; 35c.

——— *Share Valuation Tables.* [Gives the formulas of several methods for computing the value of shares of stock].—S. Afr. Mg. Jnl. April 8 1916; p 26; pp 1½; 75c.

General Miscellany

Smith, G. O.—*The Public Interest in Mineral Resources.* [Discusses the subject from the point of interest as a resource and asset to the country and not individual owners of mines only].—Min. Res. of U. S.; I:A; pp 9.

Ore and Metal Markets; Prices-Current

New York, June 1, 1916.

Silver.—Quotations for silver per fine ounce at New York and per standard ounce at London for the week ended May 31 were as follows:

	New York Cents.	London. Pence.
May 25	71½	34 3/16
26	71⅜	34 3/16
27	71⅛	34 1/16
29	70⅞	33⅞
30	Holiday	—
31	69¾	32⅝

MONTHLY AVERAGE PRICES OF SILVER.

Month.	New York 1916 High.	Low.	Avg.	1915. Avg.	London Standard Oz. 1916. Avg.	1915. Avg.
January	57⅝	55⅞	56.775	48.890	26.875	22.744
February	57	56½	56.755	48.477	27.000	22.759
March	60¾	56⅜	57.935	49.926	27.080	23.650
April	73½	60⅞	64.415	50.034	31.375	23.259
May	....	....	.....	49.915	.....	23.560
June	....	....	.....	49.072	.....	21.577
July	....	....	.....	47.519	.....	22.950
August	....	....	.....	47.178	.....	22.750
September	....	....	.....	48.68	.....	23.600
October	....	....	.....	49.385	.....	23.923
November	....	....	.....	51.713	.....	24.640
December	....	....	.....	55.038	.....	26.232
Year	....	....	.....	49.690	.....	23.470

Difference in domestic and foreign prices explained by the fact that the New York quotations are per fine ounce; the London per standard ounce 8.925 fine.

Copper.—A decided reaction in copper prices developing from active reselling of metal, a falling off in the demand and the sentimental influence due to sharp breaks in standard copper at London have been noted since our last report. Prices on nearby metal have fallen off about 3 cts., and while the quotations of first hands on electrolytic for delivery after August are unchanged, they are wholly nominal, as there has been no trading whatever to justify them. It is apparent from developments in the past week that a number of consumers overbought copper and were waiting until the market had reached its crest before reselling. As soon as the general demand subsided offers came out and about 4,000,000 lbs. copper for both nearby and forward delivery changed hands on sales by consumers. Second hands were also active sellers on the belief that producers would be unable to check the reaction. At this writing this profit taking has about been concluded and from close observation of the situation there are no prospects of further reaction. Copper producers have the situation well in hand. Their policy of conservatism when selling was extremely active in limiting price advances is now proving its value by enabling them to curb any downward trend arising from liquidation of small holdings.

In some quarters the view has been held that the reaction in the metal has been inspired by large consumers, who are seeking to cover forward requirements and before doing so are endeavoring to depress the market. Nearby copper was sold by second hands at 28½ cts., with some first hands offering spot at 29½ cts., the latter finding no buyers. For third quarter delivery some small producers asked 28 cts., with fourth quarter quoted by these interests at 27½ cts., while the prices of large producers were about 1 to 2 cts. higher.

Selling of metal by first hands last week was limited, but some wire and brass makers who have been troubled by strikes were enabled to dispose of their excess holdings at a fair profit. Foreign demand has been wholly absent, but expectations are that while the warring powers have recently shown a disposition to limit purchases of all commodities for delivery up to the end of the year, the time for covering needs over the first half of next year is well nigh at hand. In all probability it will be such buying that will form the basis for another movement in copper that will clean up what production for this year remains unsold and also result in heavy selling against 1917 output.

Last week standard copper at London declined violently, but at the opening of the current week the market advanced. The closing out of the end of May speculative accounts in copper under the order of Lloyd George was responsible for the break in the London market. Standard spot dropped £17, with futures down £16. American electrolytic also suffered, declining £10, closing the week at £148. Peace talk has also been a factor in the weaker market at London.

Production of copper continues to increase. Latest estimates by authorities place the monthly output at 190,000,000 lbs. Producers are continually expanding output and it is evident that a continuation of excellent conditions in the metal is regarded as a certainty.

Quotations for copper per pound at New York for the week ended May 31 were as follows:

	(For Third Quarter Delivery.) Lake.	Electrolytic.	Casting.
May 25	29 @29¼	29 @29¼	27 @27¼
26	28½@29	28½@29	26½@27
27	28¼@28⅝	28¼@28⅝	26 @26⅜
29	28 @28½	28 @28½	26 @26½
30	Holiday	—	—
31	28 @28½	28 @28½	26 @26½

Quotations for copper per ton at London for the week ended May 31 were as follows:

	Standard— Spot.	Futures.	Electrolytic.
May 25	£129 0 0	£128 0 0	£152 0 0
26	121 0 0	120 0 0	148 0 0
27	121 0 0	120 0 0	148 0 0
29	125 0 0	125 0 0	148 0 0
30	121 0 0	119 0 0	142 0 0
31	121 0 0	119 0 0	144 0 0

MONTHLY AVERAGE PRICES OF COPPER.

New York—Lake Superior.

Month.	1916 High.	Low.	Average.	1915. Average.
January	25.50	23.00	24.101	13.891
February	28.50	25.25	27.437	14.72
March	28.25	27.25	27.641	15.11
April	30.00	28.50	29.40	17.398
May	.....	.....	.....	18.812
June	.....	.....	.....	19.92
July	.....	.....	.....	19.423
August	.....	.....	.....	17.472
September	.....	.....	.....	17.758
October	.....	.....	.....	17.925
November	.....	.....	.....	18.856
December	.....	.....	.....	20.375
Year	.....	.....	.....	17.647

New York—Electrolytic.

Month.	1916 High.	Low.	Average.	1915. Average.
January	25.50	23.00	24.101	13.707
February	28.50	25.25	27.462	14.572
March	28.25	27.25	27.410	14.96
April	30.50	28.25	29.65	17.057
May	.....	.....	.....	18.601
June	.....	.....	.....	19.173
July	.....	.....	.....	19.08
August	.....	.....	.....	17.222
September	.....	.....	.....	17.706
October	.....	.....	.....	17.859
November	.....	.....	.....	18.826
December	.....	.....	.....	20.348
Year	.....	.....	.....	17.47

Quotations for electrolytic cathodes are 0.125 cent per lb. less than for cake, ingots and wire bars.

New York—Casting Copper.

Month.	New York 1916 High.	Low.	Avg.	London 1916. Avg.	1915. Avg
January	24.25	22.00	23.065	88.008	60.760
February	27.00	24.12½	26.031	102.760	63.392
March	27.75	25.50	26.210	106.185	66.235
April	28.00	26.75	27.70	103.681	77.461
May	.....	.....	.....	.....	77.250
June	.....	.....	.....	.....	82.250
July	.....	.....	.....	.....	74.507
August	.....	.....	.....	.....	67.350
September	.....	.....	.....	.....	68.550
October	.....	.....	.....	.....	72.577
November	.....	.....	.....	.....	77.400
December	.....	.....	.....	.....	88.400
Year	.....	.....	.....	.....	.....

Tin.—Under pressure of heavy arrivals and with consumers neglecting the market, prices of tin have receded, spot and forward positions dropping from 1 ct. to 1¾ cts. Sellers

have done very little busi[illegible] and hopes are held that the May statistics will prove bullish and assist in a revival of demand and prices. The steady receipt of tin from London has definitely killed the fear of export permits being held up and both consumers and sellers are now confident of steady importation of supplies, the former withholding purchases and the latter willing to sell for forward delivery. Weaker markets at London and Singapore also tended to depress tin here, while competition of Banka and English tin remains active and is having its effect on Straits tin. Spot tin receded to 47¼ cts. last week and at the opening this week was held very weak at 47 cts. For June arrival of Straits tin sellers asked 46 cts., with July held at 44¾ cts., August at 43¾ cts. and September at 43¼ cts.

Receipts of tin since the first of the month total 3812 tons, with 3502 tons afloat to this country. Indications are that deliveries into consumption during May were heavy and will tend to overcome the heavy imports. Reports from the Straits state that May shipments will show a falling off of about 1500 tons, not amounting to more than 4000 tons. Such a statistical presentation would materially aid tin sellers. Indications that London was shipping freely were seen in the offerings of tin for June arrival ex London steamers. Consumers apparently are disposed to refrain from covering forward needs until something in the nature of a sensational war development forces them to buy. Peace talk of a sound nature would aid tin prices, as peace would mean that Germany and Austria would resume buying. At London last week Straits tin declined £4 to £194, while at Singapore the market receded £5 10s to £194 10s.

Quotations for tin per pound at New York and per ton at London and Singapore for the week ended May 31 were as follows:

	New York		London	
	Spot.	May.	Straits, spot.	Singapore.
May 25	47½c	47½c	£194 0 0	£194 10 0
26	47½c	47c	194 0 0	194 10 0
27	47¼c	47c	194 0 0	194 10 0
29	47c	47c	196 5 0	194 10 0
30	Holiday		196 10 0	194 0 0
31	45¾c	47c	196 0 0	191 0 0

MONTHLY AVERAGE PRICES OF TIN, NEW YORK.

	1916			1915.
Month.	High.	Low.	Average.	Average.
January	45.00	40.87½	41.881	34.296
February	50.00	41.25	42.634	37.321
March	56.00	46.25	50.48	48.934
April	56.00	[illegible]	52.27½	44.38
May	.....	.....	.....	38.871
June	.....	.....	.....	40.373
July	.....	.....	.....	37.498
August	.....	.....	.....	34.386
September	.....	.....	.....	33.13
October	.....	.....	.....	33.077
November	.....	.....	.....	39.375
December	.....	.....	.....	38.75
Year	.....	.....	.....	38.664

Lead.—There has been an absolute lack of developments that would strengthen the lead market. The outside market has been receding, while the principal producer has barely been able to maintain its price of 7.50 cts. over the closing days of the month, so as to make that price the average. Independents have been willing to take orders at 7.25 cts. New York, ¼ ct. under the A. S. & R. Co. price, but consumers are not buying. Expectations are that the leading interest will readjust prices early in June and that with lead selling lower, buying will be resumed. The Japanese government purchased the 7000 tons lead on which it took bids last week from Japanese dealers, who underbid the leading interest. The actual amount purchased was 2000 tons more than that bid on. Some small orders have been placed in this market by Italy and Russia during the week. Sellers offered June lead at 7.25 cts. New York and 7.20 cts. St. Louis, but consumers were not attracted. At London the market declined 5s in spot and futures last week, but advanced 5s at the opening of the current week.

Quotations for lead per pound at New York and per ton at London for the week ended May 31 were as follows:

	New York		London	
	Indpts	A. S. & R.	Spot.	Futures
May 25	7.25c	7.50c	£31 7 6	£31 10 0
26	7.25c	7.50c	[illegible]	31 10 0
27	7.25c	7.50c	[illegible]	31 10 0
29	7.25c	7.50c	[illegible]	31 15 0
30	Holiday		[illegible]	32 10 0
31	7.25c	7.50c	[illegible]	32 10 0

MONTHLY AVERAGE PRICES OF LEAD.

	New York			1915.	London	1915.
	1916				1916.	
Month.	High.	Low.	Avg.	Avg.	Avg.	Avg.
January	6.20	5.50	5.926	5.730	31.92	18.637
February	6.55	6.10	6.271	3.350	33.108	19.804
March	8.00	6.50	7.47	4.066	.....	22.010
April	8.00	7.37½	7.50[illegible]	4.206	33.70	21.100
June	.....	.....	.....	5.875	.....	25.750
July	.....	.....	.....	5.738	.....	25.611
August	.....	.....	.....	4.756	.....	22.140
September	.....	.....	.....	4.627	.....	22.[illegible]2
October	.....	.....	.....	4.682	.....	23.922
November	.....	.....	.....	5.152	.....	26.240
December	.....	.....	.....	5.346	.....	28.884
Year	.....	.....	.....	4.675	.....	23.099

Lead Ore.—In the Missouri-Kansas-Oklahoma district lead ore prices were down a little in sympathy with the decline in spelter and zinc ore prices, but as yet the pig metal has gone down practically none. The best ores brought $93 per ton. During the week ended May 27 there were 1,983,620 lbs. of concentrates shipped and valued at $91,092. This brought the total lead production for the year to 46,497,042 lbs., which is valued at $2,116,104. The production has been falling off for the past several weeks and it may be that this curtailment will eventually give strength to the market and cause another advance in prices.

MONTHLY AVERAGE PRICES OF JOPLIN LEAD ORE.

	1916			1915.
Month.	High.	Low.	Average.	Average.
January	81.00	70.00	73.15	47.00
February	90.00	83.00	86.45	47.00
March	100.00	87.00	93.50	48.70
April	118.00	91.40	106.20	50.50
May	.....	.....	.....	50.50
June	.....	.....	.....	53.50
July	.....	.....	.....	53.00
August	.....	.....	.....	47.50
September	.....	.....	.....	48.25
October	.....	.....	.....	51.80
November	.....	.....	.....	63.00
December	.....	.....	.....	71.375
Year	.....	.....	.....	53.34

Zinc Ore.—Absence of buyers in the Missouri-Kansas-Oklahoma district was noted during this past week and prices were still going down as a direct result of this and secondarily because of the continuous decline in spelter prices, which has been continuous for the past few weeks. In carload lots the better grades of blende sold at $95 per ton and this price ranged down to $60. In the week ended May 27 11,644,895 lbs. of concentrates were produced and made the total for the year 298,012,174, which had the respective values of $440,719 and $14,923,525. The production was only about 100,000 lbs. below what it was for the previous week, but is over 5,000,000 lbs. short of what the price was during weeks when higher prices prevailed.

Calamine was off some and the ores brought from $50 to $60. There were 537,150 lbs. produced and valued at $14,000. The production for the year to date was 17,826,800 lbs., valued at $675,629.

MONTHLY AVERAGE PRICES OF JOPLIN ZINC ORE.

	1916			1915.
Month.	High.	Low.	Average.	Average.
January	120.00	85.00	106.25	53.90
February	130.00	86.00	119.75	64.437
March	115.00	80.00	100.50	62.50
April	100.50	98.00	99.25	61.25
May	.....	.....	.....	69.60
June	.....	.....	.....	116.00
July	.....	.....	.....	111.00
August	.....	.....	.....	60.25
September	.....	.....	.....	76.75
October	.....	.....	.....	82.40
November	.....	.....	.....	92.50
December	.....	.....	.....	87.00
Year	.....	.....	.....	102.96

Spelter.—Sellers continued to shade prices on spelter but aside from a sale of 1000 tons to France there has been nothing to indicate a reversal of trend. War prices on this metal are gradually ebbing away, and at the present rate of recession the time is not far off when normal prices may prevail. Domestic consumers are not interested in spelter, even by wide price concessions, and although it is generally felt that they are not large holders of stocks, it is evident that they are waiting until the bottom has been reached. Spot was offered down to 14 cts. New York and 13¾ cts. St. Louis. For June delivery sellers asked 13½@13¾ cts., with July quoted at 12½@12¾ cts. For delivery in August and

September and October one interest sent out offers at 10½ cts. without attracting business. At London the market has been declining in sympathy with the fall here. Since our last report spelter at London has dropped £15 in spot and £10 in futures.

Quotations for spelter per pound at New York and per ton at London for the week ending May 31 were as follows:

	New York Spot.	London Spot.	London Futures.
May 25	11 c.	£90 0 0	£80 0 0
26	11½c.	90 0 0	79 0 0
27	11½c.	90 0 0	79 0 0
29	11c.	80 0 0	70 0 0
30	Holiday	80 0 0	70 0 0
31	12¾c.	80 0 0	70 0 0

MONTHLY AVERAGE PRICES OF SPELTER.

	New York 1916 High.	1916 Low.	1916 Avg.	1915. Avg.	London 1916. Avg.	1915. Avg.
January	19.42½	17.30	18.801	6.519	89.840	30.819
February	21.17½	18.67½	20.094	8.866	97.840	39.437
March	20.50	16.50	18.40	10.125	100.720	44 278
April	19.37½	17.75	18.76	11.48	98.103	48.942
May	.....	.....	.....	15.825	.....	67.320
June	.....	.....	.....	22.625	.....	100.320
July	.....	.....	.....	20.803	.....	98.160
August	.....	.....	.....	16.110	.....	68.250
September	.....	.....	.....	14.493	.....	64.400
October	.....	.....	.....	14.196	.....	64.196
November	.....	.....	.....	16.875	.....	88.240
December	.....	.....	.....	16.675	.....	89.153
Year	.....	.....	.....	13.914*	.....	66.959

*For the first nine months; spot market nominal thereafter.

MISCELLANEOUS METALS.

Quicksilver.—There is apparently a wide range between asking and selling prices of this metal. Sales of spot quicksilver at $75 per flask have definitely been established, while leading sellers are asking $80 per flask. The market is absolutely without support and prices seemingly vary with the seller. There is little business reported and extreme weakness prevails.

Antimony.—Further recession in antimony is noted, good brands for spot delivery being offered at 25 cts., while for 60 days' shipment from China sellers have asked 21 cts. Antimony has lost almost half of its value in the past 6 weeks, thus attesting the extent of the decline in this metal. Increased competition and fewer shell contracts are factors.

Aluminum.—Some fair sales of spot Virgin ingots have been made at 59@60 cts., the prices being unchanged from a week ago. For remelted 98 to 99% pure sellers still ask 57@58 cts., with No. 12 alloy remelted quoted at 48@50 cts. The leading interest is still taking orders for 1917 delivery at 35 cts.

Nickel.—Sellers report a steady demand from domestic users, with some foreign business also in the market. Prices are unchanged, ordinary forms being quoted at 45@50 cts., with electrolytic 5 cts. higher.

Platinum.—Buyers are offering $80 per ounce for refined platinum, this price representing a decline of about $5 from the previous figure. For hard metal sellers ask $85 per ounce. The market is quiet and steady.

Finished Copper, Brass and Other Products.—Sheet aluminum for 1917 delivery has been lowered $5 by sellers. Brass products have also been revised downwards as a result of the easiness in spelter. Lead products are easy in view of the lower prices on the primary markets. Copper wire is firm and active. The following prices are all f. o. b. mill:

Sheet zinc	25 .00
Sheet aluminum, 2S, cold rolled	30 .00
Sheet aluminum, 2S, base, 24 gage, prompt shipment	0.00@0.00
Copper wire	38 .00@ 2.00
Sheet copper, hot rolled	35 .00
Sheet copper, cold rolled	38 .00
High brass sheet, hot rolled	30.00@29.00
High brass sheet, cold rolled	0.00@12.00
Bronze, hot rolled	10.00@12.00
Bronze, cold rolled	0.00@ .00
Cut lead, base	0.00@ .00

Pig Iron.—Some large blocks of steel making irons were purchased last week at price concessions. The Republic Steel & Iron Co. took 15,000 tons of Bessemer and basic, the former at $20.50 furnace and the latter at $18 valley furnace. The Maryland Steel Co. purchased 15,000 tons basic at $20 delivered Sparrows Point. In foundry grades business has been quiet, with the market holding fairly steady, less resale iron being evident. Indications are that extensive foreign orders will soon be placed here and prospects are for a general revival in pig iron business.

Ferromanganese.—Offers of English 80% spot ferromanganese at $250 seaboard were noted this week. This price is $150 lower than the top figure. Consumers are not attracted by the reduction. Competition by domestic furnaces forced the price concession, as domestic makers have been selling for July delivery at $250 furnace for 80% or equivalent. English makers still ask $175 for 1917 contracts, but it is thought that they will lower prices shortly, as domestic furnaces are expected to cut well under that figure.

PRICES-CURRENT.

Acids—Muriatic, 18 deg.	3.00	to	3.25
Muriatic, 20 deg.	3.25	to	3.50
Nitric, 36 deg.	.07¾	to	.08
Nitric, 40 deg.	.08½	to	.08¾
Alcohol—U. S. P., gal. grain	2.70	to	2.72
Denatured, 188 proof, gal.	2.68	to	2.70
Wood, 97 p. c.	.70	to	.71
Alum—Powdered, lb.	.04½	to	.09
Ground, lb.	4.10	to	.08½
Lump, lb.	.04	to	.08
Ammonia—			
Muriate, white grain, lb.	.08¾	to	.08⅞
Muriate, lump	.17	to	.18
Arsenic—White, lb.	.06¾	to	.06½
Red, lb.	.65	to	.70
Barium Chloride—ton	110.00	to	115.00
Nitrate, kegs, lb.	.18	to	.19
Bismuth—Metallic, lbs.	3.11	to	3.20
Subnitrate	3.10	to	3.15
Bleaching Powder—			
Drums, 100 lbs.	7.00	to	8.00
Borax—100 lbs., car lots	8.00	to	8.50
Coke—Connellsville furnace	2.50	to	3.00
Foundry	3.75	to	4.00
Copperas—Spot, lb.	1.50	to	2.00
Ferromanganese—Spot	250.00	to	350.00
Last half	200.00	to	225.00
Ferrosilicon, 50%			85.00
Ferrotitanium, per lb.	.08	to	.12½
Fuller's Earth, 100 lbs.	.80	to	1.05
Glaubers Salts, bags	.60	to	.70
Calcined			2.50
Iron Ore—			
Bessemer, old range, ton			4.45
Bessemer, Mesabi			4.20
Non-Bessemer, old range			3.70
Non-Bessemer, Mesabi			3.55
Lead—Granulated, lb.	.15	to	.15¾
Brown sugar	.13¾	to	.14
White crystals	.15⅝	to	.15⅞
Broken, cakes	.14⅞	to	.15
Powdered	.17	to	.17½
Litharge, American, lb.	.09	to	.09½
Mineral Lubricants—			
Black summer	.13	to	.14
20 gr., 15 c. t.	.14	to	.15
Cylinder, light, filtered, gal.	.21	to	.26
Neutral, filtered, lemon, 20 gr.	.37½	to	.38
Wood grade, 30 gr.	.19½	to	.20
Paraffin—High viscosity	.29½	to	.30
Naphtha (New York)—			
Gasoline, auto	.37½	to	.38
Benzine, 59 to 62°, gal.	.28¾	to	.29¼
Nickel Salt, double	.07½	to	.08½
Single	.10½	to	.11
Petroleum—			
Crude (jobbing), gal.	.15	to	.18
Refined, bbls.			.12
Platinum—Oz. ref.	80.00	to	86.00
Potash Fertilizer Salts—			
Kainit, min. 16% actual potash			32.00
Muriate, 80 to 85%, basis 80%, ton	450.00	to	475.00
High grade sulphate, 90 to 95%, basis of 90%	400.00	to	450.00
Hard salt, man., 12.4% actual potash	Nominal		32.00
Potassium—			
Bichromate	.61	to	.64
Carbonate, cal. 96 to 98%	1.55	to	1.57
Cyanide, bulk, per 100%	.75	to	1.00
Chlorate	.61	to	.66
Prussiate, yellow	1.40	to	1.55
Prussiate, red	4.75	to	5.00
Saltpeter—Crude, lb.	.09½	to	.10
Refined	.35	to	.36½
Soda—Ash, 58% (43% basis), bbls.	1.25	to	1.50
Strontia Nitrate, casks, lb.	.45	to	.46
Sulphur—			
Crude, ton	28.50	to	29.00
Flowers, 100 lbs.	2.50	to	2.70
Roll, 100 lbs.	1.95	to	2.25
Tin—Bichloride, 50°, 100 lbs.	16.25	to	16.75
Crystals, bbls., lb.	.35	to	.35½
Oxide, lb.	.33	to	.34
Zinc Chloride	.15	to	.20

Dividends of United States Mines and Works

Gold, Silver, Copper, Lead, Nickel, Quicksilver, and Zinc Companies.

NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization			
				Paid in 1916	Total to date	Latest	
						Date	Amt.
Acacia, g.	Colo..	1,438,989	$1	$.....	$136,194	Dec. 25,'12	$0.01
Adams, s l c	Colo..	80,000	10	.....	775,000	Dec. 25,'06	.04
Ahmeek c	Mich..	200,000	25	1,100,000	4,655,000	Apr. 10,'16	3.00
Alaska Goldfields	Alaska	250,000	5	.....	403,250	Jan. 10,'15	.15
Alaska Mexican, g.	Alaska	180,000	5	.....	3,507,340	Nov. 28,'15	.10
Alaska Mines Sec.	U. S..	500,000	5	.....	90,000	Nov. 1,'06	.....
Alaska Treadwell, g	Alaska	200,000	25	250,000	15,780,000	May 29,'16	.50
Alaska United, g.	Alaska	180,200	5	54,060	2,045,270	Feb. 28,'16	.30
Allouez	Mich..	100,000	25	.....	350,000	Apr. 10,'16	1.50
Amalgamated, c.	Mont..	1,638,829	100	.....	11,644,...	Aug. 30,'15	3.77
Am. sm. & R., com	U. S..	500,000	100	500,000	29,833,333	Mar. ..,'16	1.00
Am. Sm. & R., pf.	U. S..	500,000	100	875,000	55,671,386	Mar. 1,'16	1.75
Am. Sm. Sec. A pf.	U. S..	170,000	100	510,000	11,210,000	Apr. 1,'16	1.50
Am. Sm. Sec. B pf.	U. S..	300,000	100	750,000	16,260,000	Apr. 3,'16	1.25
Am. Zinc, L. & Sm.	Mo....	83,250	25	.....	1,108,820	Apr. 10,'15	.50
Anaconda, c	Mont..	2,331,250	50	6,99...?	174,2...	May 20,'16	1.50
Annie Laurie, g.	Utah..	25,000	100	.....	439,561	Apr. 22,'05	.50
Argonaut, g.	Cal...	200,000	5	15,000	1,635,000	Mar. 25,'16	.07½
Arizona, c.	Ariz..	.....	..	629,550	20,220,434	Apr. 1,'16	.30
Atlantic, c.	Mich..	2,000,000	25	.....	990,000	Feb. 21,'05	.50
Bagdad Chase, g. pf.	Cal...	84,819	5	.....	202,394	Jan. 1,'09	.10
Bald Butte, g. s.	Mont..	250,000	1	.....	1,354,548	Nov. 1,'07	.04
Baltic, c.	Mich..	100,000	25	.....	7,959,000	Dec. 31,'13	2.00
Beck Tunnel Con.	Utah..	1,000,000	0.10	.....	940,000	Nov. 15,'07	.02
Big Four Expl.	Utah..	500,000	1	20,000	20,000	May 15,'16	.05
Bingham-N. Haven	Utah..	228,689	5	.....	960,49...	Dec. 20,'15	.20
Board of Trade, z.	Wis..	120,000	1	.....	78,000	Jan. 15,'11	.05
Bonanza Dev	Colo..	300,000	1	.....	1,425,000	Oct. 28,'11	.20
Booth Reorganized	Nev...	999,495	5	299,874	299,87...	Apr. 26,'16	.10
Boss, g.	Idaho.	108,500	1	.....	40,850	Dec. 16,'14	.10
Boston & Colo. Sm.	Colo..	15,000	10	.....	402,...	Oct. ..,'02	.75
Bost. & Mont. Con.	Mont..	100,000	25	.....	63,225,000	May 16,'11	4.00
Breece, l. s.	Colo..	200,000	25	.....	250,000	Dec. 15,'13	.10
Brunswick Con., g.	Cal...	200,000	1	.....	30,...	Sept. 15,'15	.06
Bullion-B & Champ	Utah..	100,000	10	.....	2,768,400	July 11,'08	.10
Bullwhacker, c.	Mont..	450,000	1	.....	10,000	July 1,'07	.01
Bunker Hill Con. g.	Cal...	200,000	1	25,000	845,000	May 4,'16	.02½
Bunker Hill & Sull.	Idaho.	2,300,000	10	661,000	17,427,000	May 4,'16	.40
Butte Alex Scott	Mont..	75,000	10	11,597	221,564	Jan. 10,'16	1.15
Butte-Balaklava, c.	Mont..	250,000	10	.....	125,000	Aug. 1,'10	.50
Butte Coalition, c.	Mont..	1,000,000	15	.....	4,700,000	Dec. 1,'11	.25
Butte & Superior, z.	Mont..	272,672	10	2,931,224	8,451,169	Mar. 31,'16	10.75
Caledonia, l. s. c.	Idaho.	2,000,000	1	364,700	1,247,431	May 5,'16	.03
Calumet & Ariz., c.	Ariz..	617,412	10	1,334,824	24,483,048	Mar. 20,'16	2.00
Calumet & Hecla, c.	Mich.	100,000	25	1,500,000	130,750,000	Mar. 23'16	15.00
Calvert, z.	Wis..	78,672	1	.....	3,933	Dec. 20,'10	.05
Camp Bird, g.	Colo..	1,750,000	25	113,584	10,214,...	Jan. 1,'16	.07½
Cardiff, s. l.	Utah..	300,000	1	.....	125,000	Oct. 1,'11	.25
Carisa, g. s. c.	Utah..	600,000	1	.....	60,000	Dec. ..,'06	.01
Casmer, g.	Colo..	900,000	1	.....	26,160	Apr. ..,'04	.005
Centennial Eureka.	Utah..	100,000	25	100,000	4,000,000	Apr. 25,'16	1.00
Center Creek, l. z.	Mo....	100,000	10	55,000	855,000	May 1,'15	.25
Central Eureka, g.	Cal...	100,000	1	.....	799,159	Mar. 5,'06	.05
Century, g. s. l.	Utah..	1,000,000	1	4......	392,087	Feb. 15,'16	.05
Champion, c.	Mich.	100,000	25	2,0...000	13,080,000	May 7,'16	6.40
Chief Con.	Utah..	877,046	1	8...,...	438,...	May 7,'16	.05
Chino Copper c.	N. M..	869,890	5	1,087,...	7,785,470	Mar. 31,'16	1.00
C. K. & N. g.	Colo..	1,431,900	1	.....	171,82...	Nov. ..,'04	.01
Cliff, g.	Alaska	100,000	1	.....	115,000	Feb. 5,'14	.05
Cliff, s l.	Utah..	300,000	10	.....	90,000	Jan. 1,'13	.10
Clinton, g. s.	Colo..	1,000	1	.....	60,000	Dec. ..,'03	.30
Colo. G. Dredging	Colo..	200,000	10	2,0...000	875,000	Feb. 23,'16	1.00
Colorado, s. l.	Utah..	1,000,000	0.20	.....	2,600,000	Mar. 15,'13	.03
Columbus Con., l. s. c.	Utah..	283,540	5	.....	212,623	Oct. 14,'07	.20
Combination, g.	Nev...	320,000	1	.....	873,000	Dec. ..,'06	.15
Comstock-Phoenix	Nev...	200,000	1	.....	.....	Nov. ..,'04	.01
Con. Mercur, g.	Utah..	1,000,000	1	.....	1,2......	June25,'13	.03
Consolidated, g.	Colo..	2,500,000	1	.....	.....	Mar. ..,'02	.01
Con. St. Gothard, g.	Cal...	100,000	10	.....	11,430	Oct. 14,'08	.05
Continental, z.	Mo....	22,990	100	.....	561,000	Dec. 30,'15	10.00
Copper Range Co., c	Mich.	324,000	100	691,101	15,793,550	Apr. 15,'16	1.50
Creede Until, g.	Colo..	530,000	1	.....	187,500	July...'06	.00½
Cripple Creek, g. pf.	Colo..	125,000	1	.....	1...	Jan. ..,'02	.04
Cripple Ck. Con. g.	Colo..	2,000,000	1	.....	10...	Mar. ..,'04	.00½
Crossus, g.	Cal...	200,000	5	.....	247,...	May ..,'04	.02
Crown King.	Ariz..	400,000	10	.....	24...	May ..,'01	.02
Cumberland-Ely, c.	Nev...	1,300,900	5	.....	390,000	Sept.29,'10	.10
Dail, z. l.	Wis..	60,000	1	.....	.....	Nov. 25,'09	.05
Dalton & Lark, l. s. c.	Utah..	2,500,000	1	.....	350,000	July...'01	.02
Daly-Judge.	Utah..	360,000	1	72,...	1,250,000	Apr. ..,'16	.25
Daly, g. s. l.	Utah..	150,000	20	.....	.....	Mar...'97	.25
Daly-West, g. s. l.	Utah..	180,000	20	.....	6...	Jan. 15,'13	.10
De Lamar, g. s.	Idaho.	80,000	5	.....	2,777,520	Aug. 23,'11	.25
Diamondfield, g.	Nev...	732,000	1	.....	14,650	Sept. ..,'05	.02
Dillon, g.	Colo..	1,250,000	1	.....	156,250	Nov. ..'05	.01
Dr. Jack Pot Con.	Colo..	3,000,000	0.02½	.....	90,000	Mar. 20,'11	.....
Doe Run, l.	Mo....	65,785	100	.....	3,156,309	.....	.75
Ducktown, c.	Tenn.	973,300	5	.....	1,600,000	May 1,'12	.25
Duluth & Utah	Utah..	100,000	20	.....	1,000,000	Mar. 10,'15	.50
Eagle & Blue Bell.	Utah..	893,146	1	.....	17...	Dec. 20,'15	.05
Elkton Con., g.	Colo..	2,500,000	1	10...	10...	May 19,'16	.02
El Paso, g.	Colo..	490,000	5	.....	1,707,547	Feb. 25,'14	.10
Ernestine, g. s.	N. M..	300,000	5	.....	1...	July 5,'13	.05
Federal Sm. com.	Idaho.	500,000	100	.....	2,708,750	Jan. 14,'09	1.50
Federal Sm., pf.	Idaho.	120,000	100	240.	1...	.....	1.00
Findley, g.	Colo..	1,250,000	1	.....	350,000	Sept. ..,'06	.01
Florence Annex	Nev...	1,000,000	1	.....	40,000	Jan. 20,'06	.05
Florence (Goldfie'd)	Nev...	1,000,000	1	.....	1...	Apr. ..,'11	.10
Frances Mohawk, g.	Nev...	910,000	1	.....	11...	Jan. 1,'08	.05
Franklin	Mich.	166,...	25	.....	2,238,...	Aug. 2,'15	6.00
Fremont Con., g.	Cal...	200,000	2.50	.....	261,000	.....	.05
Free Coinage, g.	Colo..	10,000	100	.....	180,000	Dec. 25,'09	1.00
Frontier, z.	Wis..	1,250	100	.....	17...	Dec. 9,'13	2.00
Gemini-Keystone, l.	Utah..	5,000	100	2...	.....	Mar. 15,'16	5.00
General Dev. Co.	N. Y..	120,000	25	150,000	.....	Mar. 1,'16	1...
Glanville, z.	Wis..	2,800	25	.....	15,400	June 4,'06	1.00
Golconda	Ariz..	850,000	1	.....	170,...	Dec. 15,'15	.10
Gold Chain g.	Utah..	100,000	25	.....	.....	May 25,'13	.....
Gold Coin of Victor.	Colo..	1,000,000	1	.....	1,350,000	1...	.02
Gold Dollar Con., g.	Colo..	2,500,000	1	.....	.....	Dec. 1,'12	.00½
Gold King Con., g.	Colo..	5,750,370	1	.....	1,351,...	Nov. 1,'15	.01
Gold Roads.	Ariz..	300,000	10	.....	150,000	Nov. ..,'06	.25
Gold Sovereign	Colo..	1,800,000	1	.....	.....	Nov.14,'12	.....
Golden Centre, g.	Cal...	275,000	1	2...	.....	Apr. 1,'16	.04
Golden Cycle, g.	Colo..	1,500,000	1	150,000	7,0...	.....	.02

NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization			
				Paid in 1916	Total to Date	Latest	
						Date	Amt.
Golden Eagle, g.	Colo..	480,915	$1	$.....	$98,916	Sept.. '01	$0.01
Golden Star, g.	Ariz..	400,000	5	.....	125,000	Mar.15,'10	.05
Gold Coin, Fra., g.	Nev...	925,000	1	.....	92,111	Aug. ..,'12	.10
Goldfield Con.	Nev...	3,559,148	10	.....	28,999,831	Oct. 31,'15	.10
Good Hope, g. s.	Colo..	500	100	.....	941,250	Jan.... '03	.25
Grand Central, g.	Utah.	500,000	1	.....	1,548,200	Dec. 23,'15	.02½
Grand Gulch, c. s.	Nev...	239,845	2.50	.....	2,400	Mar. 1,'16	.01
Granite, g.	Alaska	430,000	1	.....	8,600	Apr.10, '16	.02
Gwin, g.	Cal...	100,000	10	.....	481,500	.....	.25
Hazel, g.	Cal...	900,000	1	.....	1,114,000	Jan. 6,'15	.01
Hecla, s. l.	Idaho	1,000,000	0.25	500,000	4,255,000	May 20,'16	.10
Hercules, g.	Idaho	1,000,000	1	1,20...000	12,000,000	May 15,'16	.50
Hidden Treasure, g.	Cal...	30,000	10	.....	457,452	Sept.. '00	.10
Holy Terror, g.	S. D..	500,000	1	.....	172,000	Jan.... '00	.01
Homestake, g.	S. D..	251,160	100	716,370	41,274,322	May 25,'16	.65
Hope Dev.	Cal...	500,000	1	.....	9,000	Dec. 31,'15	.01
Horn Silver, l. s. z.	Utah.	400,000	1	20,000	5,682,000	Feb. 5,'16	.05
Imperial, c.	Ariz..	500,000	10	.....	300,000	June 24 '07	.20
Independ'ce Con., g	Colo..	2,500,000	1	.....	281,375	Apr. ..,'01	.04
Inspiration Con.	Ar.z..	920,687	20	1,149,859	1,149,859	May 1,'16	1.25
Inter'l Nickel, com.	U. S..	1,901,576	100	1,901,576	21,601,266	Mar. 1,'16	3.00
Inter'l Nickel, pf.	U. S..	89,126	100	267,378	5,614,824	May 1,'16	1.50
Intern'l Sm. & Ref.	U. S..	100,000	100	.....	4,100,000	May 2,'14	2.00
Interstate-Callahan	Idaho	450,000	10	690,000	3,220,000	Mar. 31,'16	1.50
Iowa, g. l.	Colo..	1,666,667	1	.....	270,167	Jan. 31,'15	.00½
Iowa Tiger, g. s. l.	Colo..	3,000	10	.....	25,179	Jan. 15,'15	.50
Iron Blossom, l. s. g.	Utah.	1,000,000	1	150,000	2,650,000	Apr. 15,'16	.10
Iron Cap pfd. c.	Ariz..	33,481	10	.....	23,381	Dec. 31,'15	.17½
Iron Clad, g.	Colo..	1,000,000	1	.....	50,000	Nov. ..'06	.05
Iron Silver.	Colo..	1,000,000	20	.....	5,050,000	Dec. 31,'15	.10
Isabella, g.	Colo..	2,250,000	1	.....	742,500	Mar.... '01	.01
Isle Royale, c.	Mich.	150,000	25	.....	150,000	Mar. 31,'13	1.00
Jamison, g.	Cal...	390,000	10	.....	378,300	Jan.... '11	.02
Jerry Johnson, g.	Colo..	2,500,000	0.10	.....	187,500	Dec. 5,'14	.00½
Jim Butler.	Nev...	1,718,021	0.10	17,180	188,982	Feb. 2,'16	.01
Joplin Ore & Spelter	Mo....	400,000	1	22,004	22,004	May 1,'16	.05½
Jumbo Ext., g.	Nev...	1,550,000	1	116,250	609,615	Mar. 31,'16	.07½
Kendall, g.	Mont	500,000	5	50,000	1,555,000	Apr. 3,'16	.10
Kendrick Zinc	Mo....	200,000	..	40,000	40,000	Apr. 23,'16	.10
Kennecott.	Alas.	250,000	10	2,800,000	7,800,000	Mar. 31,'16	1.00
Kennedy, g.	Cal...	100,000	100	.....	1,801,001	June...'00	.05
King of Arizona, g.	Ariz..	200,000	1	.....	396,000	Aug. 2,'09	.12
Klar Orquett, z.	Wis..	200,000	1	.....	157,000	Dec. 16,'12	.25
Knob Hill, g.	Wash.	1,000,000	1	.....	70,000	Aug. 1,'13	.00½
La Fortuna, g.	Ariz..	250,000	1	.....	1,200,500	Oct.... '02	.01½
Lake View	Utah.	500,000	1	50,000	102,500	May 10,'16	.02½
Last Dollar, g.	Colo..	1,500,000	1	.....	180,000	Feb. 23,'03	.02
Liberty Bell, g.	Colo..	1,950,651	1	.....	1,752,585	Jan. 1,'15	.05
Lightner, g.	Cal...	102,255	1	.....	331,179	June...'06	.05
Linden, z.	Wis..	1,020	10	.....	11,200	Dec. 31,'15	.50
Little Bell, s. l.	Utah.	300,000	1	.....	60,000	Sept.22,'10	.05
Little Florence	Nev...	1,000,000	1	.....	430,000	Jan.... '11	.03
Lost Packer	Idaho.	150,000	1	.....	37,500	Oct. 23,'13	.25
Lower Mammoth	Utah.	1,000,000	1	.....	67,000	Dec. 15,'15	.01
Lucky Budge, z.	Mo....	400	100	.....	46,800	Apr. 23,'06	12.00
MacNamara, g. s.	Nev...	734,576	1	.....	40,399	May 2,'10	.02
Magma, c.	Ariz..	240,000	5.00	120,000	360,000	Mar. 31,'14	.50
Mammoth, g. s. c.	Utah.	400,000	.10	40,000	2,360,000	Apr. 20,'16	.05
Manhattan-Big 4, g.	Nev...	762,400	1	.....	30,248	Aug. 15,'11	.02
Mary McKinney, g.	Colo..	1,399,252	1	.....	1,169,306	July 28,'14	.02
Mayflower.	Utah.	900,000	0.25	40,000	284,000	May 2,'16	.02
Mary Murphy, g. s. l. z	Colo..	370,000	5	.....	50,134	Dec. 10,'15	.07
Mexican, g.	Nev...	201,600	3	.....	171,360	June 4,'14	.75
Miami, c.	Ariz..	747,113	5	2,054,563	7,464,442	May 15,'16	1.50
Mine La Motte, l.	Mo....	300,000	10	.....	300,000	Jan. 23,'04	.20
Modoc, g. s.	Colo..	500,000	1	.....	275,000	Oct. 1,'10	.01
Mogollon, g. s.	N. M.	355,682	1	.....	130,000	Oct. 1, '15	.10
Mohawk, c.	Mich.	100,000	25	700,000	4,575,000	Feb. 1,'16	7.00
Moh'k Com. Lease.	Nev...	500,000	1	.....	115,000	July 22,'08	.08
Moh'k (Goldfield)	Nev...	710,000	1	.....	568,000	Sept. 1,'12	.08
Moh'k Jumbo Lease	Nev...	600,000	1	.....	198,000	Nov. 20,'08	.03
Mon'ch-Madonna, g.	Colo..	1,000,000	1	.....	40,000	May 15,'11	.01
Mont. Ore Purch.	Mont.	80,833	25	.....	9,448,119	Jan. 29,'07	10.00
Mont-Tonopah, g.	Nev...	1,000,000	1	.....	530,000	Dec. 20,'12	.10
Montgomery, g.	Colo..	300,000	1	.....	27,000	Dec. 15,'11	.05
Morning Star Drift.	Cal...	2,400	100	.....	854,400	Sept. ..,'13	3.00
Moscow, s. l. c. z.	Utah.	797,601	1	.....	67,480	Dec. 20,'14	.03
Mountain G.	Cal...	250,000	25	.....	4,216,250	May 14,'08	.44
Mountain View.	Utah.	139,720	1	.....	12,554	Aug. 25,'06	.05
Mt. Diablo, s.	Nev...	50,000	100	.....	260,271	Jan. 28,'00	.10
Mt. Rosa, g.	Colo..	900,000	1	.....	19,987	Nov. 8,'05	.01
Napa Con., q.	Cal...	100,000	7	.....	1,840,000	June 20	.40
National g.	Nev...	750,000	1	.....	670,000	May 1,'11	.10
National Lead, com	U. S..	1,...	100	206,554	9,235,754	Mar. 31,'16	1.00
National Lead, pf.	U. S..	243,678	100	426,501	32,479,061	Mar. 1,'16	1.75
National, z. l.	Mo....	500,000	1	45,000	60,000	May 31,'16	....
Nevada Con.	Nev...	2,000,000	1	1,000,000	28,8...	Mar. 31,'16	.50
Nevada Douglas.	Nev...	922,900	1	.....	125,000	Dec. 1,'13	.02½
Nevada Hills.	Nev...	746,000	1	.....	373,716	.....	.10
Nev. Keystone, g.	Nev...	.....	1	.....	61,700	Feb. 18,'04	.03
Nevada Wonder.	Nev...	1,108,240	1	.....	0...	Nov. 20,'15	.05
New Baltic.	Mich.	20,000	25	.....	35,000	July 15,'13	.50
New Century, z.	Mo....	200,000	1	.....	1,170,000	.....	.01
Newhouse, l. c.	Utah.	600,000	10	.....	600,000	Nov. 20,'07	.10
New Idria, q.	Cal...	100,000	5	100,000	1,930,000	Mar. 2,'16	1.00
New Jersey, z.	U. S..	100,000	100	.....	.....	.....	2.00
New Zealand Con.	Cal...	675,000	1	.....	129,600	Mar. 7,'02	.03
North Butte, c. g. s.	Mont.	430,000	15	430,000	12,507,000	.....	.50
North Star, g.	Cal...	250,000	10	50,000	4,837,040	Mar. 30,'16	.20
O. P. Izard, z.	Wis..	120,000	1	.....	144,000	May 15,'11	....
Ohio, g.	Mo....	69,909	10	.....	1,...	Nov. 7,'10	.20
Old Dominion Co., h	Ariz..	32...	25	737,382	8,0...,880	Mar. 31,'16	....
Old Dominion, m.	Ariz..	162,000	25	4...	.....	Mar. 30,'16	2.50
Old Town Con., g.	Colo..	2...	1	.....	.....	Aug. 7,'05	....
Ontario, s. l.	Utah.	150,000	100	.....	13,917,500	1...	.30
Ophir, g. s.	Nev...	201,600	3	.....	2,...	Jan. 25,'12	.10
Opohongo, c. g. s.	Utah.	8...	0.25	.....	.....	Jan. 30,'13	.01
Orizaba, z.	Wis..	490	100	.....	.....	.....	10.60
Oroville Dredging.	Cal...	697,936	..	.....	2,...	Mar. 31,'16	.12
Oroville Union, g.	Cal...	52,...	1	14,...	1...	May 12,'16	.13
Osceola, l. s.	Mich.	96,150	25	673,...	13,...	Apr. 29,'16	4...
Osceola, l. z.	Mo....	98,000	..	.....	220,...	Oct. 1,'12	.05
Parrot, c.	Mont.	2...	10	.....	7,...	May 15,'16	.15
Pewabic, z.	Wis..	5,000	100	.....	152,...	May ..,'12	.20
Pioneer, g. s.	Wash.	1,970,710	..	.....	.....	.....	.....

Continued on next page.

Corrected to June 1, 1916

Dividends of Mines and Works—Continued

NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization			
				Paid in 1916	Total to Date	Latest	
						Date	Amt.
Petro, g. s.	Utah	500,000	$ 1	$	$85,000	Aug. 9, '06	$0.04
Pharmacist, g.	Colo.	1,500,000	1		91,500	Feb. 1, '10	.00½
Phelps, Dodge & Co	U. S.	450,000	100	2,700,000	48,371,527	Mar. 31, '16	6.00
Pioneer, g.	Al'ska	5,000,000	1		2,041,526	Oct. 7, '11	.03
Pittsburg, l. z.	Mo.	1,000,000	1		20,000	July 15, '07	.02
Pittsburg-Idaho, l.	Ida.	1,000,000	1		249,104	July 15, '13	.04
Pitts Silver Peak	Nev.	2,700,000	1		840,600	Dec. 1, '14	.02
Platteville, l. z.	Colo.	500	60		179,500	June 15 '07	10.00
Plumas Eureka, g.	Cal.	150,625	10		2,831,294	Apr. 5, '01	.06
Plymouth Con.	Cal.	240 000	5		172,800	Dec 29,'16	.25
Portland, g.	Colo.	3,000,000	1	180,000	10,517,886	Apr. 20,'16	.03
Prince Con., s. l.	Nev.	1,000,000	2	75,000	200 000	pr. 1, '16	.05
Quartette, g. s.	Nev.	100,000	10		375,000	July 31, '07	.20
Quicksilver, pf.	Cal.	43,000	100		1,931,411	Apr. 8, '03	.50
Quilp, g.	Wash.	1,500,000	1		87,000	Feb. 1, '12	.01
Quincy, c.	Mich.	110,000	25	330,000	22,107,500	Mar. 20, '16	3.00
Ray Con., c.	Ariz.	1,460,504	10	774,464	5,350,691	Mar. 31, '16	.50
Red Bird, g. s. c. l.	Mont.	300,000	5		72,000	Oct. 9, '04	.01
Red Metal, c.	Mont.	100,000	10		1,200,000	Apr. 1, '07	4.00
Red Top, g.	Nev.	1,000,000	1		125,170	Nov.26,'07	.10
Republic, c.	Wash.	1,000,000	1		85,000	Dec. 28, '10	.01½
Richmond, g. s. l.	Nev.	54,000	1		4,453,797	Dec. 23, '00	.01
Rocco- Home, l. s.	Nev.	300,000	1		152 500	Dec. 22, '05	.02
Rochester Ld. & L.	Mo.	4,900	100		190,846	July 1, '12	.50
Round Mountain, g.	Nev.	889,018	1		363,964	Aug.25,'15	.04
Sacramento, g.	Utah	1,000,000	5		308,000	Oct. 22, '06	.00½
St. Joseph, l.	Mo.	1,464,798	10	352,350	10 620,248	Mar. 20, '16	.25
St. Mary's M. L.	Mich.	160,000	25	1,120,000	6,080,000	May 29, '16	2.40
Schoenh'r-Wal'n,z.l	Mo.	10 000	10		90,000	Sept.20,'11	.25
Ser. ich Gravel	Cal.	1,000,000	1	20,000	20,000	Feb. 1, '16	.02
Seven Tro. Cn., g. s.	Nev.	1,453,007	1	56,250	252,743	Apr. 1, '15	.02½
Shannon, c.	Ariz.	300,000	10		750,000	Jan. 30,'13	.50
Shattuck Ariz., c.	Ariz.	350,000	10	787,500	3,762,500	Apr. 20,'16	1.25
Silver Hill, g. s.	Nev.	108,000	1		88,200	June 24'07	.05
Silver King Coal'n	Utah	1,250,000	5	375,000	13,959,885	Apr. 1, '16	.15
Silver King Con.	Utah.	637,582	1	63,758	878,616	Apr. 22, '15	.10
Silver Mines Expl.	N. Y.	10,000	100		250,000	June 16 '10	2.00
Sioux Cons., l. s. c.	Utah	745,389	1		872,105	July 20,'13	.04
Skidoo, g.	Cal.	1,000,000	5		365,000	Oct. 2, '14	.01
Smuggler, s. l. z.	Colo.		5		2,235,000	Nov.22,'06	.03
Snowstorm, c.	Idaho	1,500,000	1		1,169,610	Oct. 10, '13	.01½
Socorro	N. M.	377,500	5	18,865	158,335	Feb. 15, '16	.05
South Eureka, g.	Cal.	299,981	1	104,950	1,346,784	May 15, '16	.07
So. Swansea, g. s. l.	Utah	300,000	1		287,500	Apr. 3, '04	.01½
Spearfish., g.	S. D.	1,500,000	1		165,500	Jan. 7, '05	.01
Standard Con., g. s.	Cal.	178,394	10		5,274,408	Nov 17, '13	.25
Standard, c.	Ariz.	425,000	1		69,500	Sept. 8, '05	.50½
Stewart, l. z.	Idaho.	1,238,364	1		2 043,297	Dec. 31, '15	.01
Stratton's Crip. Ck.	Colo.	2,000,000	1		300,000	Sept. 6, '08	.02½
Stratton's Ind.	Colo.	1,000,000	5		5,028,568	Dec. 23, '06	0.12
Str'n's Ind. (new) g.	Colo.	1,000,000	.60	160,000	691,250	Jan. 31, '16	.16
Strong, g.	Colo.	1,000,000	1	..	2,275,000	July 9, '05	.02

NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization			
				Paid in 1916	Total to Date	Latest	
						Date	Amt.
Success.	Ida.	1,500,000	$1	$255,000	$1,160,000	May 23,'16	$0.03
Superior & Pitts., c.	Ariz.	1,499,792	10		10,318,568	Dec. 21, '15	.38
Swansea, s. l.	Utah	100,000	5		334,500	Apr. 29,'07	.05
Tamarack, c.	Mich.	60,000	25		9,420,000	July 23,'07	4.00
Tamarack-Custer	Idaho.	2,000,000	1	40,000	40,000	May 1, '16	.02
Tennessee, c.	Tenn.	200,000	25	300,000	5,206,250	Apr. 15,'16	.75
Tightner	Cal.	100	100		160,000	Jan. 3, '14	..
Tomboy, g. s.	Colo.	310,000	5		3,659,000	Dec. 31,'15	.24
Tom Reed, g.	Ariz.	909,555	1		2,555,934	Sept. 5,'15	.01
Ton.-Belmont, g.	Nev.	1,500,000	1	375,008	8,018,026	Apr. 1, '16	.12½
Ton. Extension, g. s.	Nev.	1,272,501	1	190,888	1,178,084	Apr. 1, '16	.10
Tonopah, g. s.	Nev.	1,000,000	1	300,000	13,300,000	Apr. 21,'16	.15
Tonopah Midway, g	Nev.	1,000,000	1		250,000	Jan. 1, '07	.05½
Town Topics, g. s.	Colo.	1,000,000	1		50,000	Nov. 7, '03	.00
Tremont	Cal.	200,000	2.50		234,000	Apr. 28',15	.02
Tri-Mountain, c.	Mich.	100,000	25		1,100,000	Oct. 30, '12	3.00
Tuolumne, c.	Mont.	800,000	1		495,525	Apr. 15, '13	.10
Uncle Sam Con, s.	Utah.	500,000	1		470,000	Sept.30,'11	.05
Union, g.	Colo.	1,250,000	1		444,244	Jan. 27, '03	.02
Union Basin, z.	Ariz.	835,350	1		167,070	Nov. 16,'15	.10
United, c., pf.	Mont	50,000	100		1,500,000	Apr. 15, '07	3.00
United, c., com.	Mont.	450,000	100		6,125,000	Aug. 6, '07	1.75
United, z. l., pf.	Mo.	19,556	25		211,527	Oct. 15, '07	.50
United Copper, c. s	Wash.	1,000,000	1		40,000	Dec. 21, '12	.01
United (Crip. Ck)	Colo.	4,009,100	1		440,435	Jan. 1, '10	.04
United Globe, c.	Ariz.	23,000	100	345,000	3,001,500	Mar.30, '16	15.00
United Metals Sell.	U. S.	50,000	100		11,000,000	Sept. 23'10	6.00
United Verde, c.	Ariz.	300,000	10	1,350,000	37,372,800	May 3, '16	.75
U. S. Red & R. com.	Colo.	69,188	100		414,078	Oct. 9, '03	1.00
U. S. Red & R., pf.	Colo.	39,458	100		1,776,936	Oct. 1, '07	1.50
U. S. S. R. & M., com	USMx	351,105	50	614,351	7,239,630	Apr. 15,'16	.75
U. S. S. R. & M., pf.	USMx	486,350	50	859,112	17,654,810	Apr. 15,'16	.87½
Utah, c.	Utah.	1,624,489	10	4,061,220	36,783,122	Mar.31,'16	2.50
Utah, s. l. (Fish Sps)	Utah.	93,000	10		283,720	Oct. 21, '10	.02½
Utah-Apex, s. l.	Utah.	528,200	5	132,050	198,075	Apr. 1, '16	.12½
Utah Con., c.	Utah	300,000	5	225,000	9,375,000	Apr. 10,'16	.75
Victoria, g. s. l.	Utah	250,000	1		507,500	Jan. 1, '04	.04
Vindicator Con., g.	Colo.	1,500,000	1	90,000	3,352,500	Apr. 25,'16	.03
Wasp No. 2, g.	S. D.	500,000	1	100,000	649,466	May 15,'16	.02½
Wellington, l. z.	Colo.	10,000,000	1	200,000	850,000	Mar.15,'16	.02
West End Con.	Nev.	1,788,486	1		536,645	Jan. 15,'16	.05
West Hill	Wis.	20,000	1		28,000	Sept.29,'10	.09
White Knob, g. pf.	Cal.	200,000	10	20,000	150,000	Feb. 10,'16	.10
Wilbert	Ida.	1,000,000	1	20,000	30,000	May 1, '16	.01
Wolverine, c	Mich.	60,000	25	360,000	8,760,000	Apr. 1, '16	6.00
Wolverine & Ariz., c	Ariz.	118,674	15		53,403		.25
Work, g.	Colo.	1,000,000	1		1,597,685	Apr. 31,'12	.02
Yak.	Colo.	1,000,000	1		2,007,685	Dec. 31,'15	.07
Yankee Con., g. s. l.	Utah	1,000,000	1		167,500	Feb. 1, '13	.01
Yellow Aster, g.	Cal.	100,000	10	15,000	1,187,789	Apr. 6, '16	.03
Yellow Pine	Cal.	1,000,000	1	350,000	1,043,008	Mar.31,'16	.15
Yosemite Predc.	Cal.	24,000	10		102,583	July 15,'14	.10

Corrected to June 1, 1916

*Includes dividends paid by Silver King Mg. Co. to 1907—$10,675,000

Dividends of Foreign Mines and Works

NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization			
				Paid in 1916	Total to Date	Latest	
						Date	Amt.
Ajuchitlan	Mex.	50,000	$ 5	$	$237,500	July 1, '13	$0.25
Amistad y Concordia g s	Mex.	9,600	50		429,358	July 15,'03	1.28
Amparo, s. g.	Mex.	2,000,000	1	100,000	2,032,176	Feb. 10,'16	.05
Bartolo de Medina Mill	Mex.	2,000	25		103,591	Aug. 1, '07	.50
Batopilas, s.	Mex.	446,268	20		55,870	Dec. 31, '07	.12½
Beaver Con., s.	Ont.	2,000,000	1	60,000	650,000	Apr. 29,'16	.03
Boleo, g.	Mex.	120,000	20		721,871	May 8, '11	5.00
British Columbia, c.	B. C.	591,709	5		615,399	Jan. 5, '13	.15
Buena Tierra.	Mex	330,000	5		160,380	Jan. 30,'15	.24
Buffalo, Ont.	Ont.	1,000,000	1		2,787,000	July 1, '14	.05
Canadian Goldfields	Can.	600,000	0.10		237,699	July 15, '14	.01¼
Cananea Central, c.	Mex.	600,000	10		360,000	Mar. 1, '12	.60
Caribou Cobalt	Ont	1,000,000	1		29,000	Sept. 1,'15	.09
Cariboo-McKinney, g.	B. C.	1,250,000	1		56,250	Dec. 1, '09	.00½
City of Cobalt	Ont.	500,000	1		138,375	May 15, '09	.01
Cobalt Central, s.	Ont.	4,761,500	1		192,845	Aug.24, '09	.01
Cobalt Lake, s.	Ont.	3,000,000	1		465,000	May 29,'14	.02½
Cobalt Silver Queen	Ont.	1,500,000	1		315,000	Dec, 1, '08	.03
Cobalt Townsite, s.	Ont.	199,282	5		1,042,259	Aug. 20,'14	.24
Comanea, s.	Ont.	800,000	5	200,000	8,040,000	Feb. 5, '16	.25
Con. Mg. & Sm., g. s. c.	B. C.	58,502	100	230 262	2,407,240	Apr. 1, '16	2.50
Crown Reserve, s.	Ont.	1,999,957	1		6,162,408	July 15,'15	.03
Dolores	Mex.	400,000	5		1,374,865	July 24,'11	.22½
Dome Mines, s.	Ont.	1,000,000	5	200,000	600 000	Mar. 1, '16	.50
Dos Estrellas, (El Oro)	Mex.	300,000	0.50		15,403,000	Sept.30,'11	1.50
El Favor	Mex.	3,500,000	1		210,000	Apr. 30,'14	.01
El Oro, g. s.	Mex.	1,147,500	5		9,136,842	July 11,'13	.24
El Rayo, g. s.	Mex.	200,020	2		140,410	Apr. 24,'11	.15
El Triunfo, c	Mex.	2,000,000	1		20,000	Aug.28,'11	.01
Esperanza, s. g.	Mex.	450,000	5		12,521,250	Dec. 31,'15	.10
Granby Con., c. g. s.		149,985	100	449,956	6,050,341	May 1, '16	1.50
Greene-Cananea, c.	Mex.	418,288	100	1,148,927	5,694,432	May 29,'16	1.00
Greene Con., c	Mex.	1,066,000	10	500,000	10,544 000	Jan. 26,'16	.50
Greene Gold Silver, pf.	Mex.	300,000	10		194 871	Mar. 28,'07	.40
Guanajuato Con.	Mex.	640,000	5		600,000	Oct. 26,'06	.07½
Guanajuato Dev., pf.	Mex.	10 000	100		274,756	Jan. 1, '11	7.00
Guggenheim Explorat.	Mex.	833,732	25	13,339,712	36,658,916	Jan. 3, '16	16.00
Haileybury, s.	Ont.	50,000	1		50,000	Apr. 5, '11	.50
Hedley	B. C.	120,000	10	60,000	1,873,320	Mar. 31,'16	.50
Hunds Com., g. s. l.	Mex.	5,000,000	1		88,000	Feb.27, '08	.02
Hollinger	Ont.	600,000	5	500,000	1,750,000	May 18,'16	.20
Jumbo, c.	Mex.	10,000	100		97,000	Feb. 27,'11	1.00
Kerr Lake, s.	Ont.	600,000	5	150,000	6,670,000	Mar. 15,'16	.25
La Blanca	Mex.	140,000	20		2,775,700	Mar.31,'13	.90
La Reguladora, s.	Mex.	400,000	5		110,000	Aug. 15,'11	.05
La Rose Con.	Ont.	1,498,657	5	119,862	5,459,982	Apr. 20,'16	.05

NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization			
				Paid in 1916	Total to Date	Latest	
						Date	Amt.
Las Cabrillas	Mex.	1,040	$10	$	$591,400	June 3,'12	10.00
Le Roi No. 2, g.	B. C.	120,000	25		1,435,520	Dec. 15,'1	$0.24
Lucky Tiger	Mex.	715,337	10	150,221	3,413,612	May 20,'16	.09
McKinley-Darragh-Sav.	Ont.	2,247,692	1	67,431	4,742,630	Jan. 1, '16	.03
Mexican, l., pf.	Mex.	12,500	100		1,018,750	May 1, '12	3.50
Mexico Con.	Mex.	240,000	10		660,000	Mar.10, '08	.25
Mexico Mines of El Oro	Mex.	180,000	5		4,478,500	June26,'14	.96
Minas Pedrazzini	Mex.	1,000,000	1		497,500	Jan. 23, '11	.06½
Mines Co. of Am.	Mex.	900,000	10		4,958,600	July 25,'13	12½
Mining Corp. of Canada	Can.	2,075,000	1		2,440,384	Nov.16,'15	.12½
Montezuma, l. pf.	Mex.	5,000	100		402,500	Nov. 15,'12	3.50
Montezuma M. & Sm.	Mex.	500,000	1		100,000	July20, '09	.04
Mother Lode	B. C.	1,250,000	1	137,500	137,500	Jan. 3, '16	.11
Naica, s. l.	Mex.	100	300		3,190,000	Oct. 11, '09	$283
N. Y. & Hond. Rosario	C. A.	200,000	10	140,000	3,890,000	Apr. 2, '16	.50
Nipissing, s	Ont.	1,200,000	5	600,000	14,040,000	Apr. 20,'16	.25
North Star, s. l.	B. C.	1,300,000	1		533,000	Feb. 1, '10	.02
Paloma, g.	Mex.	3,000	..		93,600	Dec. 1, '12	5.00
Panuco	Mex.	10,000	..		7,465,000	Nov. 4, '09	5.00
Penoles, s. g.	Mex.	120,000	20		6,451,685	Sept.30,'13	1.25
Peregrina, pf.	Mex.	10,000	100		328,656	Sept. 1, '10	3.50
Peterson Lake	Ont.	2,401,820	1	84,064	336,256	Apr. 1, '16	.01½
Pinguico, pf.	Mex.	20,000	100		780,000	Apr. 15,'13	3.00
Porcupine Crown	Ont.	2,000,000	1	60,000	660,000	Jan. 2, '16	.03
Providencia, (S. J.)	Mex.	6,000	15		963,360	Apr. 1, '08	1.00
Rambler-Cariboo	Ont.	17,500	100	17,500	327,500	Apr. 15,'16	.01
Rea Mines, Leasing	Ont.	200 000	1		12,750	Feb. 20,'15	.06½
Right of Way	Ont.	1,685,500	1	25,282	589,041	Mar. 15,'16	.00½
Rio Plata	Mex.	374,515	5		345,744	Feb. 10, '08	.05
San Francisco Mill	Mex.	6,000	25		445,086	Oct. 15, '08	1.00
San Rafael	Mex.	2,400	25		6,798,260	Jan. 11,'12	2.00
San Toy, s. l	Mex	6,000 000	100		540,000	July 24,'13	.01
Santa Gertrudis, Hdgs.	Mex.	1,500,000	5		2,255,272	Nov.16,'15	.24
Sta. Gertrudis-Guadalupe, g. s.	Mex.	60,000			3,365,000	Mar.22, '09	1.00
Sta. Maria del Paz	Mex.	9,600	12½		5,606,000	Jan. 2, '13	2.50
Seneca-Superior	Ont.	478,884	1	191,536	1,172,748	May 15,'16	.20
Soledad, s. l.	Mex.	960	20		4,479,840	Oct. 17, '11	8.00
Sorpresa, g. s.	Mex.	19,200	20		3,379,240	Jan. 5, '13	34.00
Standard, s. l.	B. C.	2,000,000	1	50,000	2,500,000	May 10,'16	.02½
Temiscamg' & Hud. Bay	Ont.	7,761	1		1,940,250	Nov.10,'14	3.00
Temiskaming, s.	Ont.	2,500,000	1	75,000	1,534,158	Mar. 15,'16	.03
Tezintlan, c.	Mex.	8,000	100		1,365,000	Jan. 1, '09	1.50
Tough-Oakes	Ont.	531,500	5	132,874	199,261	Apr. 3, '16	.12
Trethewy, s.	Ont.	1,000,000	1		1,061,988	July 15,'14	.05
Wettlaufer-Lorrain, s.	Ont.	1,416,590	1		636,386	Oct. 20, '13	.05
Yukon, g.	Y. T.	3,500,000	5	262,500	7,845,100	Mar.31,'16	.07½

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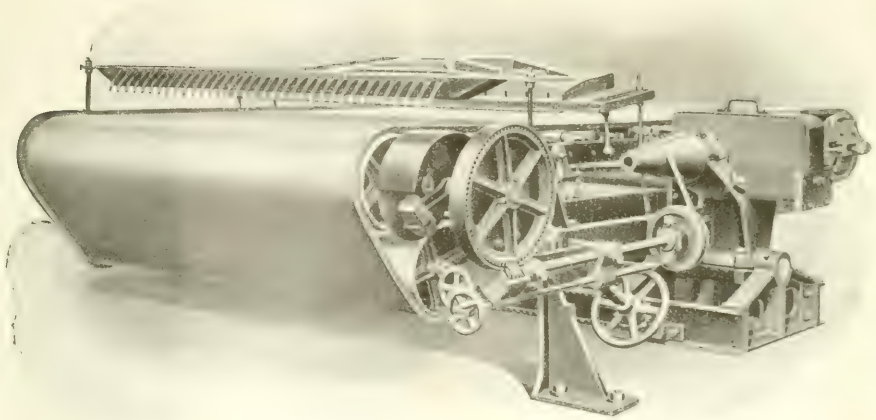

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Danville Fdy. & Mch. Co.
Lunkenheimer Co.
Queen City Foundry Co.
Robins Conveying Belt. Co.
Standard Forgings Co.
Wellman-Seaver-Morgan Co.

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Monarch Eng. & Mfg. Co.

CEMENT
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CEMENT AND CONCRETE MACHINERY

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Abbé Engineering Co.
Allis-Chalmers Mfg. Co.
Chalmers & Williams.
Fawcus Co.
International Steam Pump Co.
Lehigh Car, Wheel & Axle Wks.
Power & Mining Machinery Co.
Ruggles-Coles Eng. Co.

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Allis-Chalmers Mfg. Co.
Chalmers & Williams.
Fawcus Co.
International Steam Pump Co.
Power & Mining Machinery Co.

Lime Machinery
Allis-Chalmers Mfg. Co.
Fawcus Co.
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Traylor Engineering & Mfg. Co.

Sandlime-Brick Machinery
Abbé Engineering Co.
Allis-Chalmers Mfg. Co.
Chalmers & Williams.
Fawcus Co.
Traylor Engineering & Mfg. Co.

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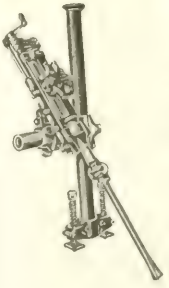

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CHANNELLING MACHINES
See Cutting Machines.

CHEMICALS
See Chemists' Supplies.

CHEMISTS AND ASSAYERS
See Professional Directory.

CHEMISTS' AND CHEMICAL SUPPLIES
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Heil Chemical Co.
Kalbfleisch Co., Franklin H.
Monarch Eng. & Mfg. Co.
Morse Bros. Mchy. & Sup. Co.

Balances
Heil Chemical Co.
Morse Bros. Mchy. & Sup. Co.
Thompson Balance Co.
Troemner, Henry.

Chemicals
Heil Chemical Co.
Kalbfleisch Co., Franklin H.
Morse Bros. Mchy. & Sup. Co.
Roessler & Hasslacher Ch. Co.

Laboratory Equipment
Abbé Engineering Co.
Heil Chemical Co.
Kalbfleisch Co., Franklin H.
Monarch Eng. & Mfg. Co.
Morse Bros. Mchy. & Sup. Co.
Moyle Engineering Co.

Pulverizers (Laboratory)
Abbé Engineering Co.
Morse Bros. Mchy. & Sup. Co.

CHIMNEYS
Reinforced Concrete
Weber Chimney Co.

CHLORINATION EQUIPMENT
Allis-Chalmers Mfg. Co.
Traylor Engineering & Mfg. Co.

CLASSIFIERS
See Slime-Treating Equipment.

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Broderick & Bascom Rope Co.
Wellman-Seaver-Morgan Co.

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Allis-Chalmers Mfg. Co.
Chalmers & Williams.
Danville Fdy. & Mch. Co.
Goodman Manufacturing Co.
Link-Belt Co.
Morgan-Gardner Electric Co.
Wellman-Seaver-Morgan Co.

COAL MINE EQUIPMENT
See Cutting Machines, Explosives and Accessories, Hoisting Equipment.

COAL: PREPARING AND MARKETING EQUIPMENT
Breakers
Bartlett & Snow Co.
Hammond Iron Works.
Robins Conveying Belt Co.
Traylor Engineering & Mfg. Co.

Pulverizers
Abbé Engineering Co.
Robins Conveying Belt Co.

Screens
Bartlett & Snow Co.
Hammond Iron Works.
Link-Belt Co.
Robins Conveying Belt Co.
Traylor Engineering & Mfg. Co.
Wellman-Seaver-Morgan Co.

Coal Bins
Hammond Iron Works.

Tipples
Bartlett & Snow Co.
Hammond Iron Works.
Link-Belt Co.
Wellman-Seaver-Morgan Co.

Washeries
Bartlett & Snow Co.
Hammond Iron Works.
Wellman-Seaver-Morgan Co.
For other Coal Preparing and Marketing Equipment see Briquetting Machinery, Transport and Handling Equipment and Conveyors and Drying Apparatus.

COKING EQUIPMENT
Cars
Wellman-Seaver-Morgan Co.

Coke Ovens
Wellman-Seaver-Morgan Co.

Coke Quenchers
Wellman-Seaver-Morgan Co.

Coke Screens
Wellman-Seaver-Morgan Co.

Rams or Pushers
Wellman-Seaver-Morgan Co.

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Dry
Allis-Chalmers Mfg. Co.
American Zinc Ore Separ'g Co.
Chalmers & Williams.

Wet
Allis-Chalmers Mfg. Co.
Chalmers & Williams.
Deister Machine Co.
Hendrie & Bolthoff M. & S. Co.
James Ore Concentrator Co.
Lane Mill & Mach. Co.
Sizer Concentrator Co.
Moyle Engineering Works.
Traylor Engineering & Mfg. Co.
See also Separators.

CONCRETE MIXERS
See Cement and Concrete Machinery.

CONCRETE REINFORCEMENT
American Steel & Wire Co.
North Western Expanded Metal Co.

CONDENSERS (Steam)
See Steam Boilers, etc.

CONTROLLERS (Electric)
See Electrical Equipment

CONVERTERS (Smelting)
Allis-Chalmers Mfg. Co.
International Steam Pump Co.
Power & Mining Machinery Co.
Traylor Engineering & Mfg. Co.

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Buchanan Co., C. G.
Chalmers & Williams.
Dick, Ltd., R. & J.
Gandy Belting Co.
Goodrich Co., The B. F.
Gutta Percha & Rubber Mfg. Co.
Robins Conveying Belt Co.

Chain Conveyors
Bartlett & Snow Co
Buchanan Co., C. G
Link-Belt Co.

Coal-Picking Belts
Bartlett & Snow Co.
Link-Belt Co.
Robins Conveying Belt Co

Elevators
Allis-Chalmers Mfg. Co.
Bartlett & Snow Co.
Buchanan Co., C. G.
Chalmers & Williams.
Link-Belt Co.
New York Engineering Co.
Robins Conveying Belt Co.

Screw Conveyors
Bartlett & Snow Co.
Chalmers & Williams.
Link-Belt Co.

CORNER PLATES
See Structural Iron and Steel.

COUPLINGS
Flexible
See Hose and Tubing.

COUPLERS (Hose)
See Hose and Tubing

CRANES
Wellman-Seaver-Morgan Co.
Western Electric Co., Inc.

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Allis-Chalmers Mfg. Co.
Bacon, Earle C.
Bartlett & Snow Co.
Chalmers & Williams.
Hardinge Conical Mill Co.
Morse Bros. Mchy. & Sup. Co.
Traylor Engineering & Mfg. Co.
Wellman-Seaver-Morgan Co.

Boss Heads
Allis-Chalmers Mfg. Co.
Chalmers & Williams.
Moyle Engineering Works.
Traylor Engineering & Mfg. Co.

Chilean Mills
Allis-Chalmers Mfg. Co
Bacon, Earle C.
Chalmers & Williams.
Hendrie & Bolthoff M. & S. Co.
International Steam Pump Co.
Morse Bros. Mchy. & Sup. Co.
Power & Mining Machinery Co.
Traylor Engineering & Mfg. Co.
Wellman-Seaver-Morgan Co.

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Bacon, Earle C.
Bartlett & Snow Co.
International Steam Pump Co.
Power & Mining Machinery Co.
Traylor Engineering & Mfg. Co.

Crushing Rolls
Allis-Chalmers Mfg. Co
Bacon, Earle C.
Bartlett & Snow Co.
Buchanan Co., C. G.
Chalmers & Williams.
International Steam Pump Co.
Lehigh Car, Wheel & Axle Wks.
Morse Bros. Mchy. & Sup. Co.
Power & Mining Machinery Co.
Traylor Engineering & Mfg. Co
Wellman-Seaver-Morgan Co.

Disintegrators
Abbé Engineering Co.
Allis-Chalmers Mfg. Co
Bartlett & Snow Co.
Link-Belt Co.

Dry Crushers
Abbé Engineering Co.
Allis-Chalmers Mfg. Co
Bacon, Earle C.
Bartlett & Snow Co.
Chalmers & Williams.
Denver Quartz Mill & Crusher.
Hardinge Conical Mill Co.
Johnson Engineering Works.
International Steam Pump Co.
Lehigh Car, Wheel & Axle Wks.
Midland Crusher-Pulv. Co.
Morse Bros. Mchy. & Sup. Co.
Moyle Engineering Co.
Power & Mining Machinery Co.
Traylor Engineering & Mfg. Co.

Jaw Crushers
Allis-Chalmers Mfg. Co
Bacon, Earle C.
Bartlett & Snow Co.
Buchanan Co., C. G.
Chalmers & Williams.
Denver Quartz Mill & Crusher.
International Steam Pump Co.
Johnson Engineering Works.
Morse Bros. Mchy. & Sup. Co.
Moyle Engineering Works.
Power & Mining Machinery Co.
Traylor Engineering & Mfg. Co.

Jaw Plates
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Pebble Mills
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Allis-Chalmers Mfg. Co
Bacon, Earle C.
Bartlett & Snow Co.
Chalmers & Williams.
Hardinge Conical Mill Co.
International Steam Pump Co.
Morse Bros. Mchy. & Sup. Co.
Moyle Engineering Works.
Power & Mining Machinery Co.
Traylor Engineering & Mfg. Co.
Wellman-Seaver-Morgan Co.

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Abbé Engineering Co.
Allis-Chalmers Mfg. Co.
Bacon, Earle C.
Bartlett & Snow Co.
Chalmers & Williams.
Denver Quartz Mill & Crusher.
Hardinge Conical Mill Co.
International Steam Pump Co.
Johnson Engineering Works.
Lehigh Car, Wheel & Axle Wks.
Midland Crusher-Pulv. Co.
Moyle Engineering Works.
Power & Mining Machinery Co.
Traylor Engineering & Mfg. Co.

Quartz Mills
Allis-Chalmers Mfg. Co.
Bacon, Earle C.
Chalmers & Williams.
Denver Quartz Mill & Crusher.
Hendrie & Bolthoff M. & S. Co.
International Steam Pump Co.
Johnson Engineering Works.
Midland Crusher-Pulv. Co.
Morse Bros. Mchy. & Sup. Co.
Moyle Engineering Works.
Power & Mining Machinery Co.
Traylor Engineering & Mfg. Co.

Roll-Jaw Crushers
Allis-Chalmers Mfg. Co.
Bacon, Earle C.
Chalmers & Williams.
International Steam Pump Co.
Morse Bros. Mchy. & Sup. Co.
Moyle Engineering Works.
Power & Mining Machinery Co.

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Allis-Chalmers Mfg. Co.
Chalmers & Williams.
Morse Bros. Mchy. & Sup. Co.
Moyle Engineering Works.
Queen City Foundry Co.

Stamps and Accessories
Allis-Chalmers Mfg. Co.
Bacon, Earle C.
Chalmers & Williams.
Morse Bros. Mchy. & Sup. Co.
Moyle Engineering Works.
Traylor Engineering & Mfg. Co.

Stone Crushers and Pulverizers
Abbé Engineering Co.
Allis-Chalmers Mfg. Co.
Bacon, Earle C.
Chalmers & Williams.
Denver Quartz Mill & Crusher.
International Steam Pump Co.
Johnson Engineering Works.
Lehigh Car, Wheel & Axle Wks.
Midland Crusher-Pulv. Co.
Morse Bros. Mchy. & Sup. Co.
Moyle Engineering Co.
Power & Mining Machinery Co.
Traylor Engineering & Mfg. Co.

Tube Mills and Linings
Abbé Engineering Co.
Allis-Chalmers Mfg. Co.
Chalmers & Williams.
Lehigh Car, Wheel & Axle Wks.
Morse Bros. Mchy. & Sup. Co.
Queen City Foundry Co.
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Goodman Manufacturing Co.
Ingersoll-Rand Co.
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Coal Punchers
Goodman Manufacturing Co.
Ingersoll-Rand Co.
Morgan-Gardner Electric Co.

Tunnelling Machines
Goodman Manufacturing Co.
Ingersoll-Rand Co.
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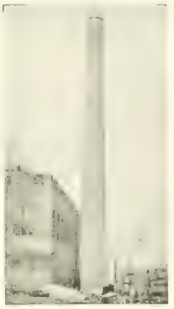

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Custom Zinc Smelters at Altoona, Iola, and La Harpe, Kansas. *Address, 413 Republic Building, Kansas City, Mo.*

Needles Mining & Smelting Company,
Custom Lead and Zinc Concentrator at Needles, Calif. *Address, Needles, Calif.*

Mammoth Copper Mining Company,
Custom Copper Smelter at Kennett, Calif. *Address. Kennett, Calif.*

Goldroad Mines Company,
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Cia de Real del Monte,
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United States Smelting, Refining & Mining Exploration Company,
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Dorr Company, The.
General Filtration Co.
Hammond Iron Works.
Monarch Eng. & Mfg. Co.
Morse Bros. Mchy. & Sup. Co.
Pierce, L. S.
Traylor Engineering & Mfg. Co.

Amalgamators
International Steam Pump Co.
Lane Mill & Mach. Co.
Morse Bros. Mchy. & Sup. Co.
Pierce, L. S.
Power & Mining Machinery Co.
Traylor Engineering & Mfg. Co.

Classifiers
Allis-Chalmers Mfg. Co.
Chalmers & Williams.
Deister Machine Co.
Dorr Company, The.
International Steam Pump Co.
Morse Bros. Mchy. & Sup. Co.
Traylor Engineering & Mfg. Co.
Power & Mining Machinery Co.

Cyanide
Allis-Chalmers Mfg. Co.
Chalmers & Williams.
Heil Chemical Co.
International Steam Pump Co.
Monarch Eng. & Mfg. Co.
Morse Bros. Mchy. & Sup. Co.
Pierce, L. S.
Power & Mining Machinery Co.
Roessler & Hasslacher Ch. Co.
Traylor Engineering & Mfg. Co.

Dewaterers
Allis-Chalmers Mfg. Co.
Chalmers & Williams.
Dorr Company, The.
Traylor Engineering & Mfg. Co.

Distributors
Allis-Chalmers Mfg. Co.
Chalmers & Williams.
Moyle Engineering Co.
Traylor Engineering & Mfg. Co

Electro Cyanide Process
Moore Filter Co.

Precipitators (Lime from Filter Leaves)
Moore Filter Co.

Zinc Boxes
Hammond Iron Works.

Zinc Dust Atomizers
Moore Filter Co.

Zinc Dust and Shavings
Heil Chemical Co.
Roessler & Hasslacher Ch. Co.

Zinc Lathes
Chalmers & Williams.
Traylor Engineering & Mfg. Co.
For other Cyanide Equipment see Tanks, Slime-Treating Equipment, Pumps, etc.

DERRICKS (Oil Well)
See Oil Well Supplies.

DETONATORS
See Explosives and Blasting

DEWATERERS
See Cyanide Equipment.

DIES (Stamp)
See Crushing and Grinding.

DISINTEGRATORS
See Crushing, etc.

DISTRIBUTORS
See Cyanide Equipment.

DRAFTING MATERIAL
See Surveying and Drafting.

DREDGES AND EXCAVATORS

Dredge Accessories
Link-Belt Co.
Marion Steam Shovel Co.
New York Engineering Co.
Union Construction Co.
Wellman-Seaver-Morgan Co.
Yuba Construction Co.

Dredges
Marion Steam Shovel Co.
Morse Bros. Mchy. & Sup. Co.
Union Construction Co.
Wellman-Seaver-Morgan Co.
Yuba Construction Co.

Excavators
Brown Hoisting Machy. Co.
Lidgerwood Mfg. Co.
Link-Belt Co.
Marion Steam Shovel Co.
Morse Bros. Mchy. & Sup. Co.
New York Engineering Co.
Union Construction Co.
Wellman-Seaver-Morgan Co.
Yuba Construction Co.
For other Dredges and Excavators see Buckets, Conveyors and Elevators, Shovels (Power.)

DRILLING AND BORING EQUIPMENT

Cable Drills
Diamond Drill Contracting Co.
Ingersoll-Rand Co.

Carbon and Bortz
Byron & Hall.
Diamond Drill Carbon Co.
Francis & Co.
Levine, Abr.
Standard Diamond Drill Co.

Core Drills
Diamond Drill Contracting Co.
Ingersoll-Rand Co.
McKiernan-Terry Drill Co.
Standard Diamond Drill Co.

Diamond Pointed Drills
Francis & Co.
Hendrie & Bolthoff M. & S. Co.

Drill Sharpeners
Denver Rock Drill Mfg. Co.
Hendrie & Bolthoff M. & S. Co.
Ingersoll-Rand Co.

Drill Steel
Chicago Pneumatic Tool Co.
Denver Rock Drill Mfg. Co.
Hendrie & Bolthoff M. & S. Co.
Ingersoll-Rand Co.
Internat'l High Speed Steel Co.
McKiernan-Terry Drill Co.

Elictric Drills
Denver Rock Drill Mfg. Co.
Hendrie & Bolthoff M. & S. Co.
Ingersoll-Rand Co.

Hammer Drills
Chicago Pneumatic Tool Co.
Denver Rock Drill Mfg. Co.
Hendrie & Boltoff M. & S. Co.
Ingersoll-Rand Co.
McKiernan-Terry Drill Co.
Morse Bros. Mchy. & Sup. Co.
Moyle Engineering Works.

Hand Drills
Hendrie & Bolthoff M. & S. Co.
Ingersoll-Rand Co.
Morse Bros. Mchy. & Sup. Co.
New York Engineering Co.

Prospecting Drills
Diamond Drill Contracting Co.
Hendrie & Bolthoff M. & S. Co.
Ingersoll-Rand Co.
McKiernan-Terry Drill Co.
Morse Bros. Mchy & Sup. Co.
New York Engineering Co.
Standard Diamond Drill Co.

Rock Drills
Chicago Pneumatic Tool Co.
Denver Rock Drill Mfg. Co.
Hendrie & Bolthoff M. & S. Co.
Ingersoll-Rand Co.
McKiernan-Terry Drill Co.
Morse Bros. Mchy. & Sup. Co.
Southwark Fdy. & Mch. Co.
Wood Drill Works.

Stoping Drills
Chicago Pneumatic Tool Co.
Denver Rock Drill Mfg. Co.
Ingersoll-Rand Co.
McKiernan-Terry Drill Co.
Morse Bros. Mchy. & Sup. Co.

Test Drills
Diamond Drill Contracting Co.
Hendrie & Bolthoff M. & S. Co.
Ingersoll-Rand Drill Co.
McKiernan-Terry Drill Co.
Standard Diamond Drill Co.
For other Drilling and Boring Equipment see under Oil-Well Supplies and Cutting Machines.

DRIVES (Chain)
Morse Chain Co.

DROP FORGINGS
See Forgings.

DRY CRUSHING MACHINERY
See Crushing and Grinding Equipment.

DRYING APPARATUS

Coal Dryers
Abbé Engineering Co.
Bartlett & Snow Co.
Lehigh Car, Wheel & Axle Wks.
Ruggles-Coles Eng. Co.
Traylor Engineering & Mfg. Co.

Evaporators
Bartlett & Snow Co.

Ore Dryers
Abbé Engineering Co.
Bartlett & Snow Co.
Chalmers & Williams.
Lehigh Car, Wheel & Axle Wks.
Ruggles-Coles Eng. Co.
Traylor Engineering & Mfg. Co.

DRYING AND HEATING ENGINEERS
Bartlett & Snow Co.
Ruggles-Coles Eng. Co.

DRUMS (Winding)
See Hoisting Equipment.

DUST PROTECTORS
Multi-Metal Separating Screen Co.

DYNAMITE
See Explosives and Blasting.

DYNAMOS
See Electrical Equipment.

DRY CONCENTRATORS
See Concentrators.

ELECTRICAL EQUIPMENT

Alternators
Allis-Chalmers Mfg. Co.
General Electric Co.
Westinghouse Elec. & Mfg. Co.

Batteries
General Electric Co.
Westinghouse Elec. & Mfg. Co.

Controllers
Allis-Chalmers Mfg. Co.
General Electric Co.
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See Explosives and Blasting.

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See Steam Boilers, etc.

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See Roofing.

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See Engines.

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See under Engines.

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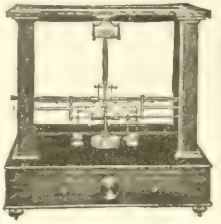

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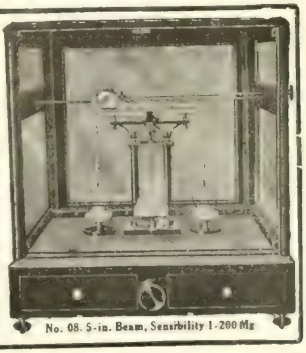

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METERS (Water)
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See under Lighting Equipment.

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See Drying Apparatus.

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See Washeries.

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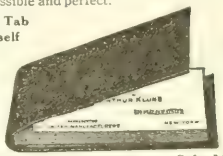
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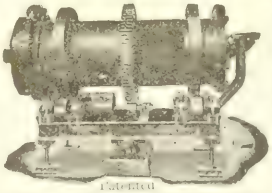
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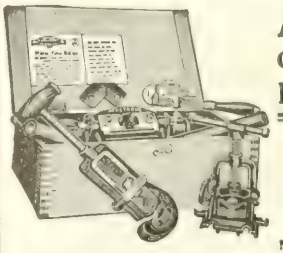
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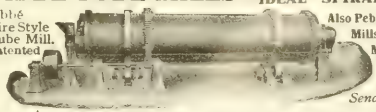

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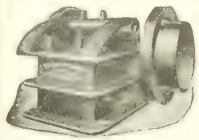

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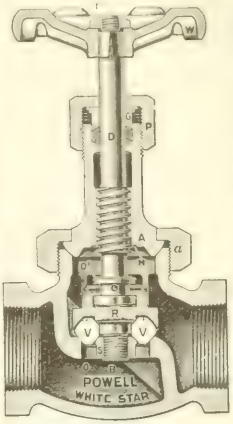

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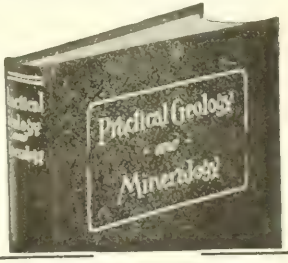

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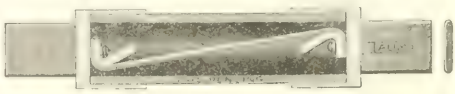

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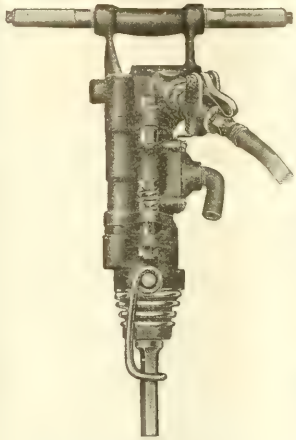

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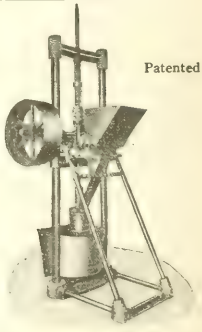

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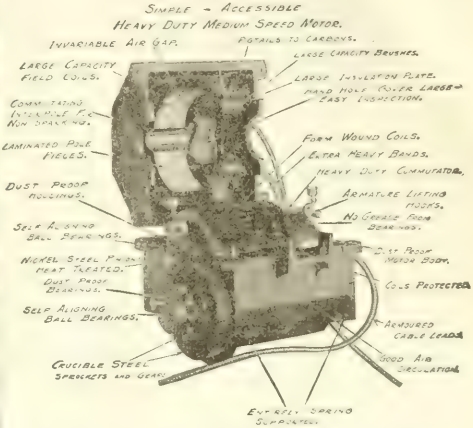

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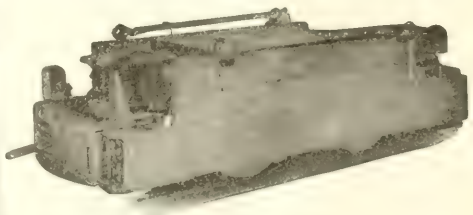

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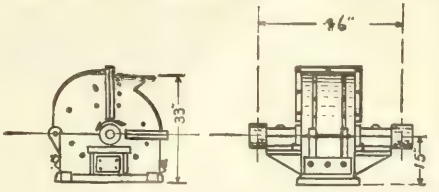

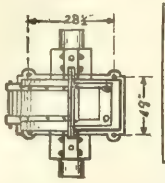

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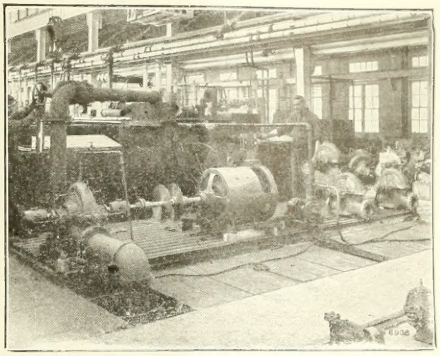

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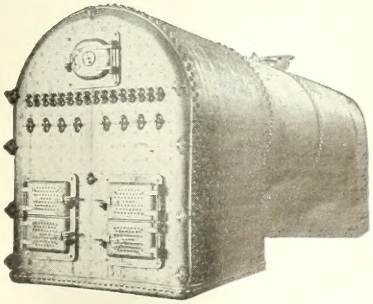

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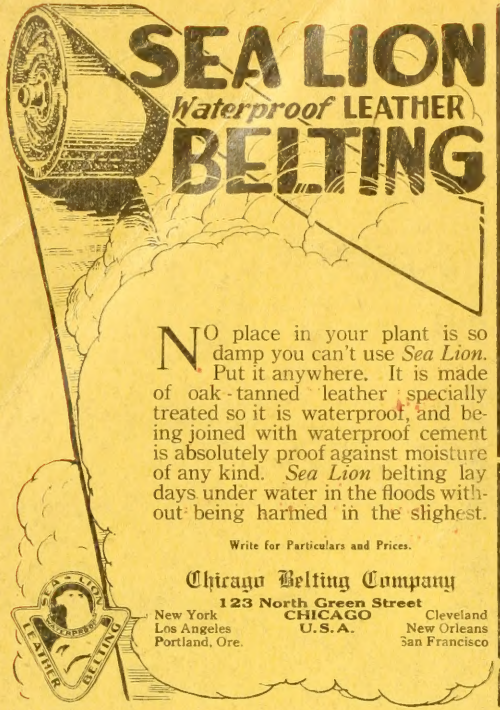

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